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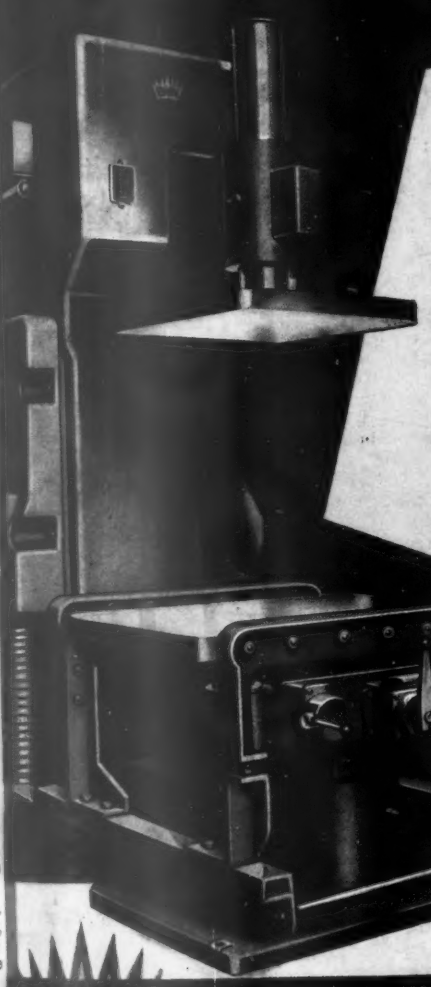

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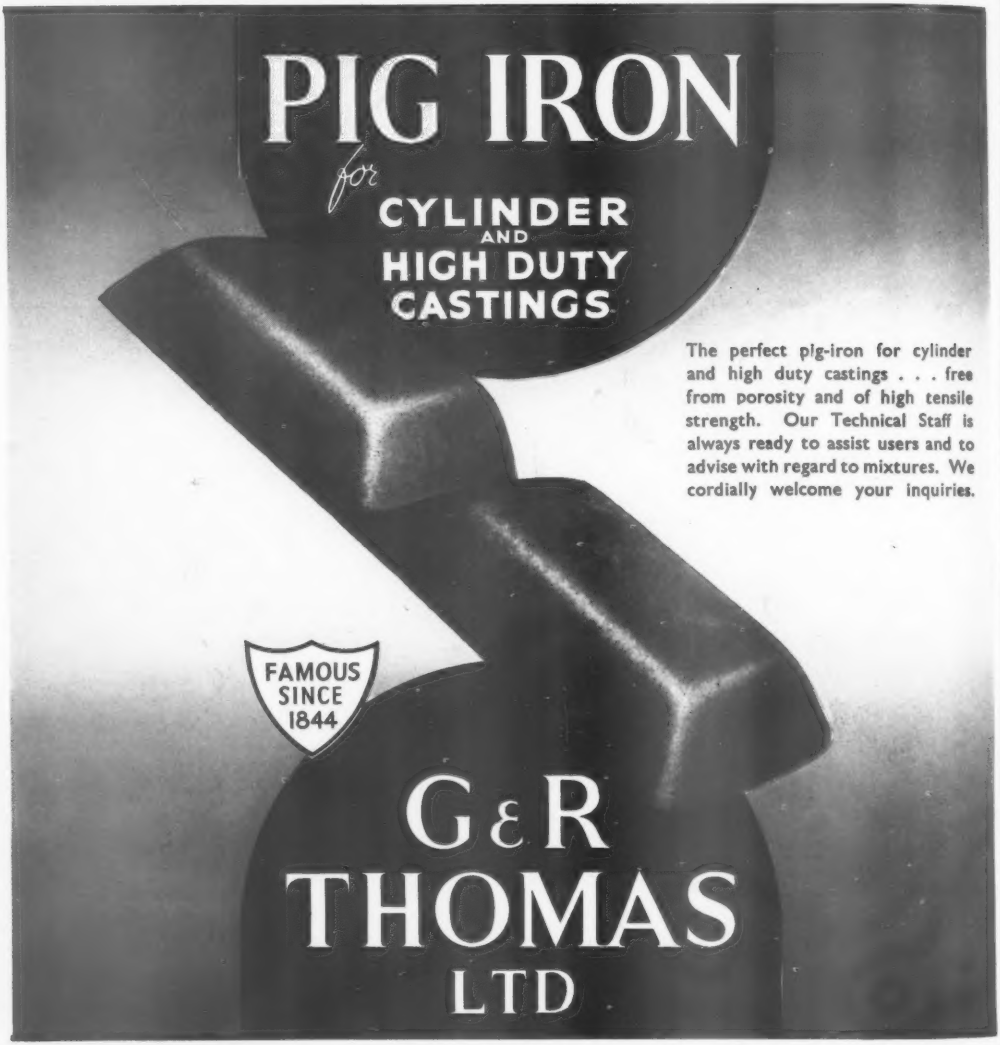

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Ironfounding Statistics, 1950-1956

The main interest of this 18-page booklet* is not to the individual ironfounder, but rather to groups; yet, the former can detect here and there where demand for a type of casting appears to be expanding, remaining static or declining. First, we must register a mild protest at the display of Table 1. On the left-hand page are tabulated the types of casting and on the right, production during the years covered. To carry the eye over from one sheet to the other is a strain. This could so very easily have been overcome by printing the reference numbers on both pages. The other tables are well and clearly presented. There is much interesting information in the very extensive second table, where the effect of the " credit squeeze " can be clearly seen. Declines in other sections give rise to speculation as to whether or not the competition from weldments is being met.

It would appear from the statistics governing malleable that castings for electrical engineering and other trades unlisted is an expanding market, as they both increased during 1956 when the overall production of castings declined. The districts which have made the most progress in recent years are Cumberland and South Wales. The gradual availability of the better classes of pig-iron over the period covered will, it is hoped, be reflected in the improvement in the quality of castings made, but on the other hand, the figures may be interpreted as a decline in high-phosphorus irons for stove-grate work and their replacement by steel pressings. The replacement of fall pipes and gutters by asbestos-based material is another, though not too serious factor.

One of the most instructive tables is one showing the number of the various types of employees over the last seven years. The employment of moulders is steadily declining with the introduction of mechanical aids to production. The table also shows that the foundry industry now directly employs some 600 fewer pattern-makers than in 1950, yet indirectly they surely employ the same number, if not more, by using the services of the master patternmakers. On the other hand, an increase of two thousand in the administrative, technical and clerical services undoubtedly reflects the increasing amount of paper-work and control methods necessitated by modern industrial conditions. One valuable aspect of this publication is the wealth of information it contains for individuals to use in stressing the importance of the ironfoundry industry on appropriate occasions, though it will involve a little arithmetic for assessing money values, which the man in the street may better appreciate.

* Issued by the Joint Iron Council, 14, Pall Mall, London, S.W.1.

German Foundrymen's Technical Association

The 48th general meeting of the *Verein Deutscher Giessereifachleute* (German Foundrymen's Technical Association) is to be held in conjunction with a conference taking place on Friday and Saturday, October 4 and 5, at Düsseldorf. The event opens at 9 a.m. in the Robert Schumann Hall with an address of welcome by the president, Dr. G. Schwietzke. During the morning and afternoon sessions in this hall the following papers are to be presented:—(1) Solution of Carbon in Austenite in Alloyed Cast Iron and its Influence on Heat-treatment, by Dr. J. Motz; (2) Results Realized in Recent Research on Cupolas, by Professor W. Patterson; (3) The Question of the Automatization in Foundry Practice, by Mr. P. Schiegries; (4) Complete Mechanization and Automatization in the Foundry, by Dip. Ing. H. Bergmann; (5) The Determination of Flowability of Non-ferrous Metals by Dr. H. Kondic (Birmingham); (6) Research on Work-study in the Foundry, by Dr. H. Scholz; (7) Training for Foremanship by Mr. L. Fredl; (8) Researches on the Skin of Castings, by Dr. F. Roll.

In a separate room—the small Congress Hall, the following papers will be submitted:—(1) Influence of Superheating on the Structure of Non-ferrous Metals, by Dr. E. Scheil; (2) A Study on the Avoidance of Microporosity in Sand and Chill-cast Magnesium Alloys, by Dip. Ing. P. Spitaler; (3) The Problems Associated with the Production of Pressure-tight Castings, by Mr. G. Lieby; (4) On the Application of Surface Cooling (chills) on the Finish of Steel Castings (crankshafts, cylinders) by Dip. Ing. A. Roth; (5) Danger of Dust in the Foundry Industry, by Dr. K. G. Schmidt; and (6) Report on Researches for the Economic Manufacture of Mould-dressing Binders, by Mr. M. Lottermoser. In the evening at 8 p.m. in the *Rheinhalle*, there is to be an hour of variety and a musical interlude following by dancing.

Film Review

"The Structure and Properties of Steel." Issued by the British Iron and Steel Federation, Steel House, Tothill Street, London, S.W.1.

This instructional film is divided into three parts—Grain Structure; Carbon Content, and Heat-treatment. Each part, which is available as 16- and 35-mm. black-and-white sound film, runs for about 15 min. It has been a very difficult film to produce, and everybody concerned warrants congratulations on having made the subject of the structure and properties so simple that it can be easily understood by an intelligent apprentice. The first correlates grain size with the mechanical properties; the second shows the influence of carbon on iron, and the third how these properties can be varied. Wisely, the subject matter has been confined to plain carbon steels. This left the reviewer wondering whether an equally simple film could be made showing the influence of silicon on grey cast iron, yet the introduction of a third dimension to iron and carbon does make for complication. There is no doubt that animated graphs in this film, especially the partial raising of shutters to show the mechanical properties of a mild-, medium- and high-carbon steel, impresses the final result on the mind more forcibly than the examination of a plain graph. The film is deemed suitable and appropriate for showing to classes in foundry practice covering ferrous metallurgy.

Pewter Competition

With the purpose of developing interest in pewter as a handicraft material, the Tin Research Institute is organizing a competition to be held early next year. It will be open to all regular students at schools of art and metalwork in the United Kingdom; competitors are free to submit articles of their own design, without restriction, but credit will be given for originality and suitability of the item for the purpose for which it was made. The winner of the first prize will receive £50, the second, £25, the third, £15, and the fourth, £10. The copyright and ownership of all articles and designs submitted will remain vested in the competitors. The adjudicators will be Sir Albert E. Richardson, past-president of the Royal Academy; Mr. Robert Darwin, principal of the Royal College of Art; and Mr. Henry Rushbury, keeper of the Royal Academy Schools. Those wishing to participate in the competition should write to the principals of their art schools or direct to the Tin Research Institute, Fraser Road, Greenford, Middlesex, for full particulars.

Patternmakers to Visit Vickers-Armstrongs, Limited, at Newcastle

As part of the programme for the current session of the National Society of Master Patternmakers, a visit has been arranged to the naval shipyard of Vickers-Armstrongs at Newcastle-upon-Tyne for Tuesday, October 15, at 2 p.m. (If sufficient members require transport to the yard, a coach will be arranged to take members from the railway station in Newcastle, where they should meet at 1.30 p.m.) After the visit, there will be a dinner and social evening at the Douglas Hotel, Newcastle-upon-Tyne, commencing at 7.15 p.m. Those members wishing to participate in the functions are asked to inform secretaries (Fisher & Firkins, 12, Cherry Street, Birmingham, 2) at once so that the necessary arrangements may be made. Those requiring over-night accommodation should make their own arrangements (in this connection an approach to Mr. Wèrge of the Skerneside Pattern Making Company, Limited, Prospect Place, off Whessoe Road, Rise Carr, Darlington, may be helpful).

Borough Polytechnic

On September 13, Mr. R. A. Marryat, B.SC., chairman of Marryat & Place, Limited, officially opened at the Borough Polytechnic, London, S.E.1, a newly equipped electrical installations laboratory by cutting a wire and thereby switching on an extensive variety of lamps and meters. This is a severely practical laboratory, where the student can dismantle and reassemble a range of both ancient and modern equipment. For apprentice electricians in the London foundries this laboratory would appear to be an ideal training centre. Mr. John W. Cooling, M.SC., presided.

Index to Vol. 102

The index to the JOURNAL, volume 102, covering the period January to June, 1957, has now been printed and is available to readers free of charge. Applications for copies should be addressed to the publishing office, FOUNDRY TRADE JOURNAL, John Adam House, John Adam Street, Adelphi, London, W.C.2. Subscribers who wish to receive indices automatically as they are printed may apply for inclusion on a permanent mailing list. Those already on this list should not need to apply for their current copy.

Defects in Cast Iron for Enamelling Purposes*

This account is written with a view to informing founders as to the effect of casting quality on the subsequent vitreous-enamelling process, and the success or otherwise of the final product. The Author contends that the cost of vitreous-enamelling castings could be substantially reduced by the founder, as he holds the view that a proportion of rejects in the enamelling shop originate in defects in the castings. This Paper outlines some of the defects that influence the quality of the final coating, dealing with variation in wall thickness and structure, together with porosity. Experiments are described and observations noted, and the Author concludes with a report on the examination of a cast-iron door.

Many of the defects in cast-iron for vitreous-enamelling purposes come to light only when the enamelled surface is finally inspected. The enameller will attempt to discover a fault in his own sphere, and to find a remedy by altering the ground, or finishing enamel. However, he may, in certain circumstances, increase the damage which will result in further enamel-shop rejects. The success of his work also depends, to a large extent, on the quality of the cast iron; the more so as (with regard to chemical and physical properties) the enamelling process constitutes a quite unnatural combination of two physically different materials, each of which is expected to benefit the other (the combined influence may be negative). Defects in the cast iron can cause hair cracks, spalling or chipping of enamel and porosity, in the enamelled product.

Influence of Wall Thickness

Observations and investigations, made over a long period, have enabled many faults to be detected in cast iron for enamelling purposes. One of these is the variation in wall thickness, which has been found to result in hair-line cracks. Considerable differences in wall thickness will result in uneven cooling and contraction during the heating and cooling cycles of the enamelling process of vitrification, setting up high-stress points which are relieved by the formation of cracks in the enamelled surface; these usually appear at the thinnest sections, and their junction with thicker sections. This cracking can be only partly obviated by altering the coefficient of expansion of the enamel. Fig. 1 shows an example of varying wall thickness in a casting. It should be noted that experience has shown the minimum thickness of castings for enamelling, is in the region of $\frac{1}{8}$-in., American practice is to employ castings with wall thicknesses of at least $\frac{1}{4}$-in., which avoids cracking and many other defects, to be discussed.

Spalling

The causes of spalling in enamel coatings is not always an inherent defect in the ground or top enamel, but may be occasioned by defects in the casting; frequently this spalling occurs in areas that have been ground. Changes in the structure of the metal also give rise to spalling; an example of this is a grey-iron casting that has solidified with white and mottled areas. When the casting is initially heated surface cracking occurs, this being preceded in many cases by considerable deformation. Investigation has shown that pickling will reveal areas of changed structures.

Results of Investigation

Investigations effected on cast iron has provided considerable data for ascertaining the effect of variations and defects on the final coat: chemical analysis revealed considerable difference in combined carbon, whilst microscopical examination indicated that there was considerable cementite formation in grey-iron castings. Dilatometric measurements carried out with a Leitz dilatometer on 2-in. specimens of grey-iron indicated only moderate alteration in length up to 950 deg. C. Test pieces of white iron showed a completely different expansion curve, the alteration in length between 760 and 860 deg. C. being so pronounced that the

FIG. 1.—*Section of a typical part of a casting, showing the considerable variation in thickness which may result in surface cracking occuring in the enamel coat.*

* Abstracted from a paper given by P. Göbbels to the *Verein Deutscher Emailfachleute* (German Enameller's Association)

range of the instrument had to be altered to accommodate the increased length. Figs. 2 and 3 show the curves for grey and white iron, the samples having been taken from a radiator and a wash basin. At 200 deg. C. there is a noticeable difference between the grey and white sample, which is caused by the magnetic transformation of the cementite, whilst the differences become even more marked at higher temperatures. Practical experience has

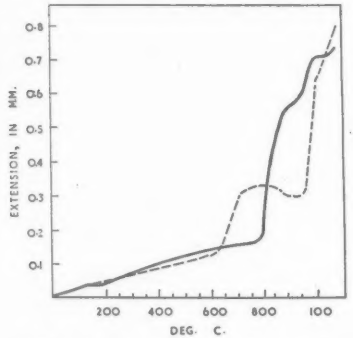


FIG. 2.—*Variation of extension with temperature of 2-in. grey- and white-iron test-pieces machined from a radiator casting, the extension having been determined by means of a Leitz dilatometer. The broken line represents the grey sample, whilst the full line is for the white sample.*

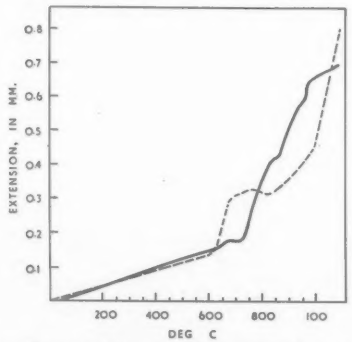


FIG. 3.—*Comparison of the extensions of 2-in. specimens of grey- and white-iron test-pieces from a hand-basin casting as measured in a Leitz dilatometer. The broken line represents the grey test-piece whilst the full line represents the white-iron sample.*

confirmed these expansion data, for castings containing structure variations can develop cracks at even relatively low temperatures. When the temperature reaches 600 deg. C., decomposition of the pearlite commences, giving a noticeable volume increase. Transformation of the ledburite in the white-iron sample at temperatures between 760 and 860 deg. C., gives rise to a sudden increase in length. The different behaviour of two test-pieces taken from the same casting indicates the impracticability of employing such a casting for enamelling, for it is unable to survive the intense internal stresses developed during the heating cycle.

In order to reproduce enamelling conditions, the set-up was altered and a reversible heating and cooling cycle was employed. The dilatometer was set to receive the sample, the furnace being heated to 950 deg. C. and the specimens rapidly heated.

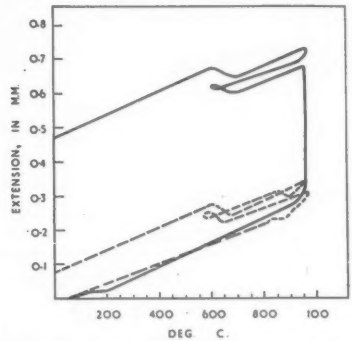
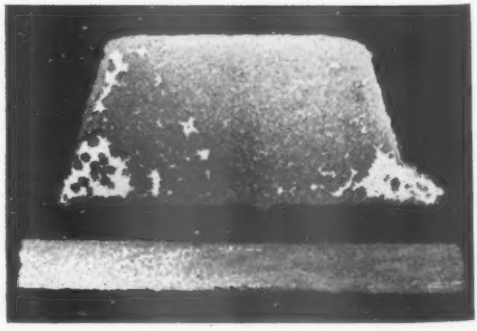


FIG. 4.—*Growth measurements determined on a Leitz dilatometer, to determine the effect of rapid heating and cooling cycles as would be applied during enamelling, on a grey- (broken line) and white-iron (full line) sample.*

After a period of ten minutes, the test pieces (one white and one grey, cut from the same casting) were allowed to cool to 600 deg. C., and then rapidly reheated to 950 deg. C. The results of this experiment are shown in Fig. 4, indicating the remarkable differences in the expansion curves. The growth observed in the grey test-piece was in the order of 0.4 per cent., whilst that of the white sample was 2.35 per cent. (*i.e.*, approximately six times the magnitude).

FIG. 5.—*Two sections of castings, nominally intended to be wholly grey, showing the incidence of white iron in zones of higher cooling rates.*



Differences in the structure of cast iron (Fig. 5) cannot be noticed, in the case of a casting produced in a synthetic sand, from the surface appearance; however, when iron is cast into a naturally-bonded sand, containing 8 to 10 per cent. moisture, white or mottled zones can be seen, for they have the preferential tendency to rust.

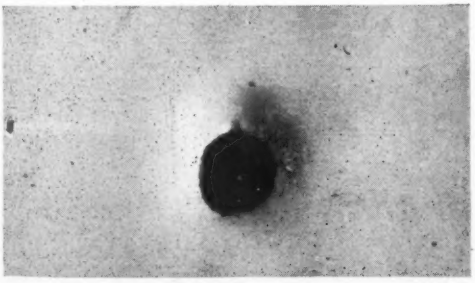
Moulding Sands and Casting Conditions

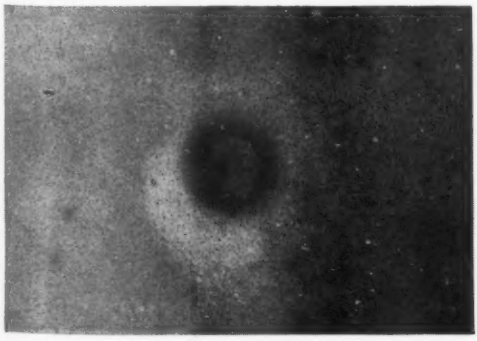
It would be wrong to make the naturally-bonded sands, with their usually higher moisture content, responsible for the described variations of the iron structure—certainly the formation of rust can be ascribed to this.

It is also possible to obtain a white structure under similar conditions with synthetic-bonded moulding-sands, but no rust will be visible and hardly anything can be noticed, except perhaps that the casting skin of the white area will have a lighter colour. In order to prevent formation of rust, which is only an outer sign for an inner fault, the founder should ensure that the iron is cast at a temperature high enough to obviate the occurrence of white or mottled zones. At the same time, care should be taken to ensure that ingates are wide enough, and the moulds filled as quickly as possible, which in turn requires a high gas permeability of the sand. It is essential that sufficient heat is brought into the mould so that the iron cools slowly through the temperature intervals of structure transformations. Chemical composition must also be maintained so that the analysis inhibits the formation of white iron, *i.e.* carbon and silicon content should be high, phosphorus moderate and sulphur as low as possible; additions of magnesium should be avoided as well as any other alloying elements.

When investigating the gas content of cast iron under the hot extraction method, high hydrogen contents were consistently found on unheated, well cleaned, test-pieces. After heating, the hydrogen content was found to be vastly reduced, and the oxygen content increased. Unfortunately it is not possible to determine the existence of an increase in the oxygen content microscopically. When examining cast iron, which solidified perfectly grey, it was found that on heating, for a time comparable with that of enamelling, the oxygen content had only slightly increased.

FIG. 6.—*Two examples of blisters—an effect of porosity in cast iron on a vitreous-enamelled surface.*





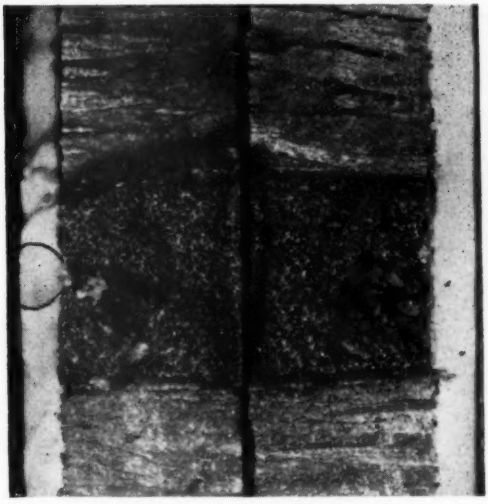


FIG. 7.—*Magnified section of an enamelled casting with cavities filled with bentonite and sand occlusions. (The blister in the enamel has been outlined by the Editor for clarity.)*

Porosity Defects

Fig. 6 shows examples of porosity in enamel coatings; at first, it was thought this defect was caused by faulty ground or top enamel, but after varying conditions, without result, it was decided to drill the faulty pieces out of the casting, and the blister was opened with a small hand saw. All opened castings showed a small cavity underneath the blister. The cavities were either gas bubbles or caused by the reaction of the iron, with occluded sand or bentonite. When the enamelling temperature is reached, some of the expanding gases leave the cavity, and on cooling, when the enamelled casting leaves the furnace, the remaining gases contract causing the still liquid enamel to be

FIG. 8.—*Stove door, which showed preferential deposition of rust in the areas of white-iron structure. The three bands that were polished for making hardness determinations can be seen.*

drawn into the cavity. Fig. 7 shows a cavity with sand and bentonite occlusions, the blister in the enamel and also the depth of the enamel sucked into the cavity can be seen.

Examination of a Stove Door

Fig. 8 shows a stove door, partly covered with rust; it can be seen that rust is formed in places farthest away from the ingates. From this it can be concluded that cooling and solidification occured too rapidly, whereas in the vicinity of the ingate system, the heat flow is quite sufficient to guarantee an even formation of the structure. As a further experiment the door (which was cast with two ingates) was polished from the position of the ingates across the front panel. One of these two lines of polished iron ran above a normal wall thickness, whilst the other was above a reinforcing rim. When Brinell readings were taken from the ingate to the opposite end, above the line of normal wall thickness, the hardness was found to increase from 263, near the ingate, to 492 on the opposite end. On a parallel line, above the reinforcing rim, the hardness throughout was found to be fairly constant at about 278 Brinell (the larger cross section had enabled the iron to cool slowly and more uniformly).

A third polished line, running from the oval air-opening, in the middle of the stove door, to the edge, was then measured and Brinell hardness figures of 282 to 325 were found. These figures indicate that a mottled or even white solidification took place where the hardness was found to be high. Many similar investigations on rust-covered pieces were carried out, and in every case the presence of mottled structure could be proved. Fig. 5 shows the macroscopic photographs of castings with rusty skins, the structure is easily recognizable. The main portion of cementite is shown to exist on the thinner section or on those places which are furthest away from the ingate, which corresponds to the higher cooling rates.

Conclusion

It can be seen that the founder can assist his colleagues in the enamel shop to reduce the quantity of rejects, by design and technological control of his processes. The main points are:—

(*a*) Improved design to ensure even wall thickness, and the prevention of high-stress points; (*b*) control of the casting temperature, location of chills, together with mould design to ensure uniform cooling rates, with subsequently even structures, and (*c*) improved feeding, coupled with high surface finish and accurate moisture control of the moulds to prevent the incidence of surface porosity and inclusions.

Raw Materials Prices Fall

Raw materials prices recorded another fall in August. The index for all basic materials (except fuel used in non-food manufacturing industry) declined by 0.4 per cent. to 154.2 (June 1949=100) or 4.6 per cent. below the peak reached during the Suez crisis. The lower prices for copper, which was down by 3.8 per cent., and tin ingots contributed to the fall in the index, which is now lower than it was a year ago. A few commodities rose in price including home-produced steel scrap (the price of which went up by 8.5 per cent), linseed oil, carbonizing coal, and lead.

The indices for all materials used in mechanical and electrical engineering rose in August. An advance of 3.9 per cent. was recorded for mechanical engineering and 2.6 per cent. for electrical engineering, higher iron and steel prices being the main causes for the rise, which was only partially offset by decreases in the prices of some non-ferrous items. Mainly as a result of lower copper prices, the index for electrical machinery materials is lower than a year ago.

Manufacturing industry's wholesale prices have risen steadily over the past year. The index for all manufactured products (except food and tobacco) rose by 0.4 per cent. in August mainly as a result of higher prices for metal manufactures, chemical products, etc. The largest single increase was that for iron and steel, which followed the 7½ per cent. average increase introduced in July. These rises brought the index for all products to 140.1, compared with 136 in August last year.

JAMES MAUDE & COMPANY, LIMITED, ironfounders, Nottingham Road, Mansfield, Nottinghamshire, are planning to extend the foundry.

Scottish Works Visits

To conclude the series of descriptions of works in the Glasgow area which are to be visited by parties of members of the Institute of British Foundrymen on "Works Visits Day" (October 4), the foundries of Singer Manufacturing Company, Limited, Alley & MacLellan (Polmadie), Limited, Stewarts and Lloyds, Limited (Tollcross), John Lang & Sons, Limited, Wm. Beardmore & Company, Limited, Robert Taylor & Company (Ironfounders), Limited, and Babcock & Wilcox, Limited, are reviewed. Brief historical notes preface each account and thereafter particulars of layout, plant and processes are dealt with in an attempt to record features of major interest for the visitors.

(*Continued from page* 338)

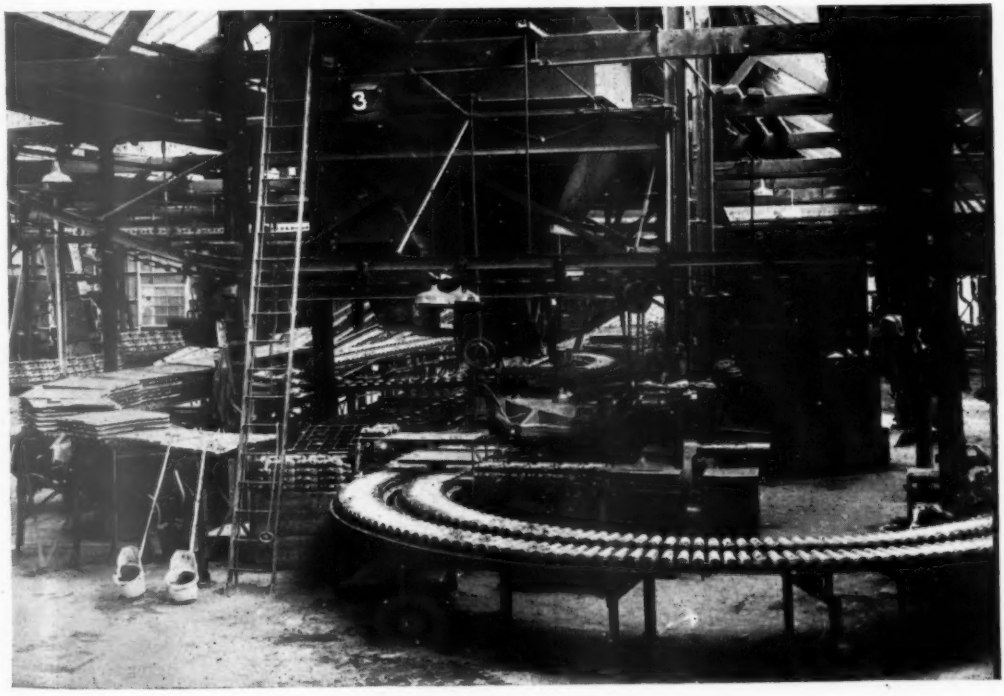
Singer Manufacturing Company, Limited

The Kilbowie factory of the Singer Manufacturing Company, at Clydebank, has been in existence since 1882; the original factory has, of course, been added to from time to time, and now covers an area of approximately 110 acres. The factory buildings have a floor space of 2,850,015 sq. ft., and are surmounted by a 200-ft. high clock tower which is 50-ft. square. Most types of sewing machines, cabinets, electric motors and needles are produced, the work being carried out by a labour force of over 13,000 employees working in 57 different departments.

Foundry

The foundry is concerned with the production of both ferrous and non-ferrous castings used entirely in the manufacture of the sewing machine and its components. To meet production requirements large tonnages of iron, aluminium and malleable iron are melted each week while smaller quantities of bronze, brass and other alloys are produced as required. The plant, which has an all-brick floor

FIG. 8.—*General view of the moulding department at the foundry of Singer Manufacturing Company, Limited, Clydebank, showing (centre) a power operated hydraulic moulding machine developed by the company, together with the extensive conveyor systems.*



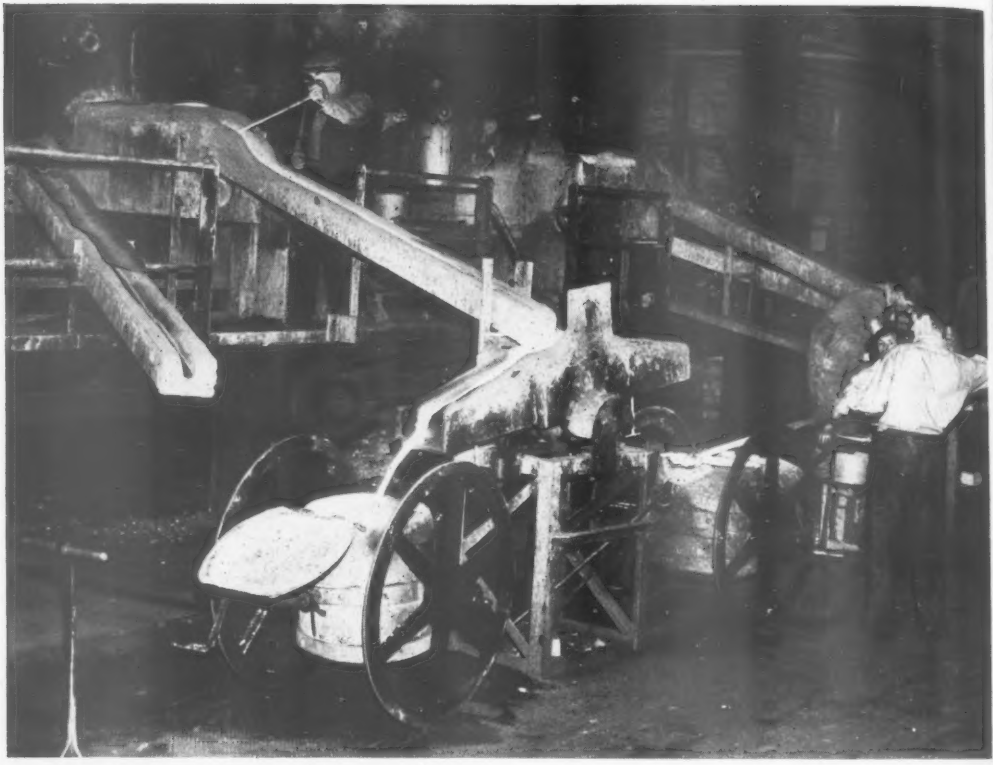


FIG. 9.—*View of part of the cupola plant at the Singer foundries showing one of the 14-ton per hour mechanically-charged furnaces, tapping into wheeled ladles, using a tilting trough.*

and metal-plate passageways, covers an area of 299,000 sq. ft. and is semi-mechanized for handling castings from 1 oz. to 20 lb. in weight. The foundry personnel comprises a total of 750 workers.

Moulding is carried on with down-sand-frame hydraulic machines and matchplate "boxless" hydraulic machines, both of original Singer design. Various progressive developments of these machines incorporating a certain amount of mechanization are in use, including one designed as a four-station powered-turret machine (Fig. 8). There is also a large battery of air-operated jolt/squeeze moulding machines producing boxless moulds, together with hand-operated squeeze machines on similar production and roll-over/jolter machines of conventional design.

A separate bay in the foundry, equipped with an overhead crane is used for making castings for machine-tools, foundry plant and equipment for the factory in general, varying in weight from a few pounds to three tons. Moulding is carried on in dry- and green-sand, using skilled tradesmen.

A battery of seven horizontal core-blowing machines are in use, producing both oil- and resin-bound cores from cast-iron coreboxes. A certain amount of small cores are also produced by hand, the cores being dried in three automatically-controlled coke-fired vertical continuous ovens.

All patterns for sewing-machine castings are made and maintained by a staff of 32 people who also make and repair all the coreboxes required. In general patterns are made, in cast iron, but wood, tin, brass, aluminium and plastics are also employed.

Melting Facilities

Within the past year, two new 14-tons per hour front-slagging cupolas have been brought into operation. These work on alternate days and their operation is fully mechanized. The charge, of 25 cwt., is collected by a make-up crane carrying a variable-lift magnet running between two rows of sleeper-lined stock bins. The latter are replenished by another crane magnet at a higher level, from wagons passing through the cupola-house. The metal charge collected by this make-up crane is discharged into a charging bucket sunk to ground level, as also are the coke and limestone from overhead bunkers through automatic vibratory feeders and an automatic-cut-off weighing hopper. The total charge in the drop-bottom charging bucket is then

raised by an automatic charging crane and fed into the cupola. Overcharging is prevented by charge-level indicators and electrical relays to cut out the charging crane when the bed level is too high to receive another charge.

Cupolas are tapped initially through a low-drain spout, and after the first "dull" metal is drawn off, pouring is switched to the spout from the front slagging box, the slag running over a notch into a static water trough with a drag-scraper conveyor which delivers granulated slag into collecting bins. Metal runs continuously *via* a tilting duct (Fig. 9) into wheeled metal bogies of 12-cwt. capacity, for transport to all parts of the foundry, where hand-ladle pouring is in general use. The cupolas are mounted on a steel staging astride a 30-in. gauge rail track carrying a steel truck for containing the furnace "drop," which is drawn out by cable and electric bollard. The underside of the steel staging carries a piped water supply for the immediate quenching of the drop.

While the new cupola furnaces now provide the bulk of the cast iron, further capacity is available in the form of one 9-tons per hour mechanically-charged unit; two hand-charged units of the same capacity; one 2-tons mechanically-charged, and one 1-ton hand charged furnace, the latter being principally used for malleable. Four oil-fired tilting furnaces, together with a rotary furnace and two gas-fired holding furnaces are available for special cast-iron and non-ferrous metals; whilst a battery of 12 coke-fired crucible furnaces are also available for "small batch" non-ferrous metals.

Cleaning, Fettling and Heat-treatment

Castings are cleaned by means of rumbler barrels using cast-iron pellets, with the exception of aluminium castings which proceed direct from foundry to dressing shop. Traditional methods are employed in the dressing shop by a staff of approximately 270 people, to buff, grind, polish, and dress castings to the high quality demanded. Malleable castings are heat-treated in a gas-fired pusher-type bogie-hearth furnace, whilst cast-iron parts are annealed, when necessary, in a mechanically-loaded gas-fired rotary-hearth type of annealing furnace and aluminium castings are stress-relieved in a hot-air electric batch-type oven.

Materials including sand, metals and scrap are transported throughout the foundry by means of electric-powered trucks, using suitable designs of bins and stillages.

Apprenticeship Scheme

Apprentice training at Singer's is normally started at the age of 16; in addition to general

FIG. 10.—*General view of one of the assembly shops at the Polmadie works of Alley & MacLellan (Palmadie), Limited. Some of the company's compressors can be seen in various stages of completion.*

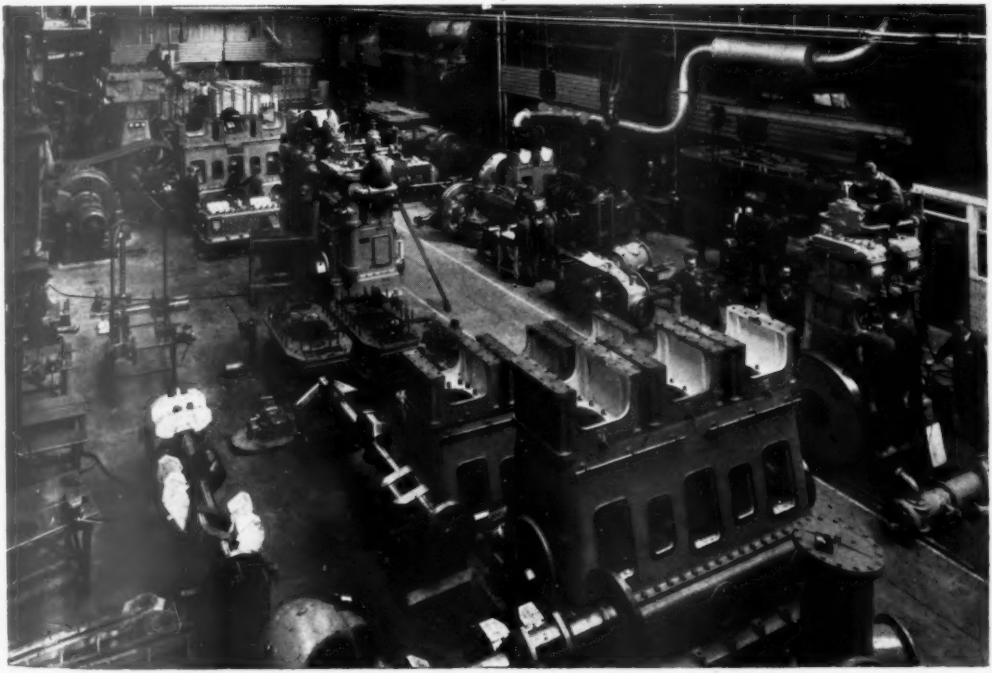


FIG. 11.—*Cupola-charging arrangements at John Lang & Sons, Limited, comprising monorail-suspended, tilting bins, the contents of which are discharged by releasing the end flap.*

training, specialized training is provided in foundry moulding which includes core-bench; dry-sand, green-sand, and general moulding together with coremaking, and patternmaking for sewing-machine parts and machine tools; general foundry-practice is also covered.

Alley & MacLellan (Polmadie), Limited

In 1875, two engineers, Stephen Alley and John MacLellan, formed a partnership under the name of Alley & MacLellan, which was taken over, in 1903, by the present public company. The original factory, producing valves and kindred items, was located at Bridgeton, in Glasgow; but as a result of expansion, the firm was moved to the present site in the Polmadie district of Glasgow. The firm is now a subsidiary of Glenfield & Kennedy (Holdings), Limited, it having been incorporated in 1945. In addition to marine components, the company now produces a range of compressors, vacuum pumps and valves, the latter being manufactured at the Worcester works, which were taken over in 1920. Developments in recent years in the Scottish works have included extensions to the machine shops, and a complete re-tooling, at the same time (1947), a new patternshop has been built. At the same period, also, a new bay was completed for heavy assembly work (Fig. 10), the office block was rearranged, a new canteen was provided, and a new system of works control, precision manufacture and meticulous inspection was inaugurated.

Iron Foundry

Established in 1900, the iron foundry occupies some 37,500 sq. ft. of the total factory space of 575,000 sq. ft., and employs 120 men of whom 77 can be classified as skilled and 20 as semi-skilled. Iron castings are produced for the engineering departments of the firm, and the company possess a Meehanite licence. Castings are normally made in the size range from a few pounds up to seven tons, although some castings have been produced weighing as much as 15 tons. Metal is supplied from two mechanically-charged cupolas, one of seven, and one of four tons per hour capacity. A new fettling shop is in the process of construction and will incorporate a Hydroblast plant, a Wheelabrator and other shotblast plant.

The company participate in the Meehanite apprentice-training scheme, and selected students are sent to the school maintained by the Meehanite group at Butterley. Amongst the numerous facilities provided for the operatives are spray baths and cloakroom amenities which include individual lockers for the foundry employees.

Stewarts and Lloyds, Limited

The post-war expansion plans of Stewarts and Lloyds, Limited, were such that the company's Sun Foundry at Coatbridge would supply only half the estimated demand of steel castings, and it was decided that a complete new foundry should be constructed rather than extend and modernize the existing foundry. The new foundry* was built adjacent to the company's tube works at Tollcross, Glasgow, and production of steel commenced in September, 1954, the transfer from the old to the new foundry being completed by March, 1955. The plant nominally caters for castings of up to 5 tons in weight.

The plant is housed in one large building consisting of three parallel bays and one cross bay, the total area of the building being 122,830 sq. ft. The cross bay houses the melting furnaces and scrap bins, while the central and west bays house the heavy and light foundries with their respective fettling shops. A small machine shop occupies 9,000 sq. ft. at the northern ends of the west bay. The third and east bay houses the coreshop, sand plant, patternshop and pattern store. The floors are all of cement with well-marked gangways. Steel is provided by two Metalectric electric-arc furnaces, nominally of four-ton capacity and rated at 2,000 kva. About 75 per cent.. of the production is of plain-carbon steels to B.S.592, 15 per cent. of alloy steels for hot-working tools, and 10 per cent. of alloy and chilled iron.

Moulding Facilities

Heavy castings are floor moulded, the facing sand being rammed by hand and pneumatic rammers, the backing sand being delivered by a

* This foundry was described in detail in the JOURNAL of June 13, 1957, p. 723

mobile Sandslinger. The facing sand consists of a washed silica sand, bonded with a proprietary air-setting compound, the backing sand being return sand bonded with bentonite. Setting of the facing sand is completed by the use of portable electrically-heated Brown-Boveri pressure air driers. The moulds are coated with a water-based zircon paint before drying.

The light shop utilizes two jolt/squeeze Coleman-Wallwork machines, one making drags and the other copes, which can take box-parts up to 3 ft. sq. and 12 in. deep. These machines deliver the moulds on pallets, already cored and closed, on to pallet conveyors, on which they are cast. After casting, the boxes are transported to a vibrating hooded knock-out by overhead crane and thence back to the machines *via* roller conveyors. The machine-moulding sand is return sand with the addition of 25 per cent. new sand and bonded with bentonite, the sand being delivered *via* hoppers which are fed by a conveyor-belt system from the sand plant. Moulds are cast "green" but prior to closing they are sprayed with an air-setting compound which imparts a hard skin to the sand surfaces. The smaller types of cores are made in oil sand by a Coleman-Wallwork coreblower or by hand when numbers are small. Drying of the cores is provided by an automatic Acme continuous stove. The larger cores are made by hand in the air-setting sand and "dried" in stoves of the conventional type.

Heat-treatment

Two Dowson and Mason bell-type gas-fired furnaces provide for the annealing of the plain-carbon steels. The heat-treatment of the alloy compositions is carried out in two Priest gas-fired furnaces, oil and water quenching tanks being positioned between the furnaces. Transfer gear is provided for charging, removal, and transfer of castings to and from the furnaces and quenching tanks.

Working Conditions

The atmosphere is relatively free of dust and is more typical of a machine shop than the old-fashioned conception of a foundry. Such conditions have been obtained by well-planned dust-extraction from the "trouble spots." There are three dust-extraction systems which serve the heavy and light knock-outs, two Wheelabrators, two swing-grinders, five double-ended grinders, and a Tumblast plant. Washing and changing facilities are provided in a separate building having 3,120-sq. ft. of floor area—the average utilization of this facility is as high as 70-80 per cent. although the men make use of it in their own time. A canteen is situated a short distance away and serves both the foundry and the other two S. & L. plants on the site. This building also houses a well-equipped medical centre under the control of a works doctor, annual X-ray being a routine procedure for personnel.

John Lang & Sons, Limited

The Lang organization at Johnstone began in 1874 as a private family partnership and was converted to a limited liability company in 1916. The family association still remains, for the six working directors, who comprise the company's present board, are all either grandsons or great-grandsons of the founder, John Lang, provost of Johnstone. Ever since the firm came into being, the durability of Lang lathes has been a byword in many famous machine shops; in fact it has often been something of an embarrassment to the makers when owners of the lathes have expected the firm to carry out repairs or replacements of parts to veteran machines which have outlasted two generations of turners.

Nowadays, the modern offices, workshops, laboratories and foundry buildings of the firm cover 6½ acres in a site of 16 acres at Johnstone, having private British Railways Scottish Region sidings in one of the busiest parts of industrial Scotland—bordering on the Clyde estuary and within 15 miles of Glasgow. As early as 1901, the company, realizing the many advantages of being independent of outside suppliers for iron castings, built what was then considered to be a model foundry, its main building being 253 by 158 ft. by 43 ft. high. Since then, the works have been progressively planned and extended to promote a manufacturing programme devoted almost exclusively to the production of lathes. The company now employs some 600 people, of whom 122 are in the

FIG. 12.—*Tapping metal into a pivoted launder at John Lang & Sons, Limited, Johnstone; the metal delivered is weighed by a dial weigher incorporated in the ladle suspension (not shown).*

FIG. 13.—*Part of an erecting bay at John Lang & Sons, Limited, at Johnstone, showing a series of lathes in various stages of assembly.*

foundry department; of these, 60 can be classified as skilled, and seven as semi-skilled operators.

For machine tools—or any other machine requiring castings—the castings are only as good as the quality of metal put into them; thus, securing optimum basic qualities of cast iron is of paramount importance to Lang's and no effort is spared to control quality at every stage. Of the special qualities of grey iron, rigidity, machinability, freedom from strains, damping capacity, strength and wear-resistance are the most important for lathe castings—in the order of importance quoted.

Patternshop and Foundry

The patternshop is well equipped with up-to-date woodworking machinery and housed in a spacious building 228 by 50 ft., in two bays, with a maximum head room of 22 ft. This gives ample space for laying out seasoned timber and large pattern-assemblies in the course of construction.

The casting of lathe beds of lengths between 8 and 33 ft. is still carried on by the best traditional method, where good craftsmanship is the keynote, and this, in the course of a generation or two, has become a highly specialized section of the foundry output. Special boxes sunk below floor level are used, the longest being actually 110 ft., while others are from 60 down to about 18 ft. In the longest box it is quite common to have four or more moulds in various stages of moulding, casting or cooling. Castings longer than 10 ft. bend on cooling and the amount that the mould has to be offset can only be found by experience; however, this is daily routine at Lang's, well established by long experience. Sand for the moulding sections is prepared in a Speedmuller, turning out some 50 tons of sand per day. Organically-bonded sand only is used for core production,' and this is prepared at a separate station.

Melting

A prominent feature of the melting equipment is the very detailed system of recording and control which is applied in the cupola practice—materials are weighed at every turn to ensure proper metal composition. The cupolas themselves are water-cooled, and fitted with balanced-blast and arrangements for oxygen-enriched blast, together with the water-curtain type of spark- and fume-arrestors. Continuous tapping and slagging is employed. Charging is facilitated by the monorail-suspended tip-up bins shown in Fig. 11; metal collection at the furnace is shown in Fig. 12.

Laboratory checks are made on all incoming foundry materials, the degree of control applied extending even to the extent of furnace-gas analysis, atmospheric-humidity and metal-fluidity testing. Daily samples are taken for slag analysis and the records of furnace operation are very comprehensive. There is also a laboratory for sand testing and research.

Fig. 13 shows a general view of an erecting bay at the company's works, where castings and fabricated sections are assembled ready for shipping.

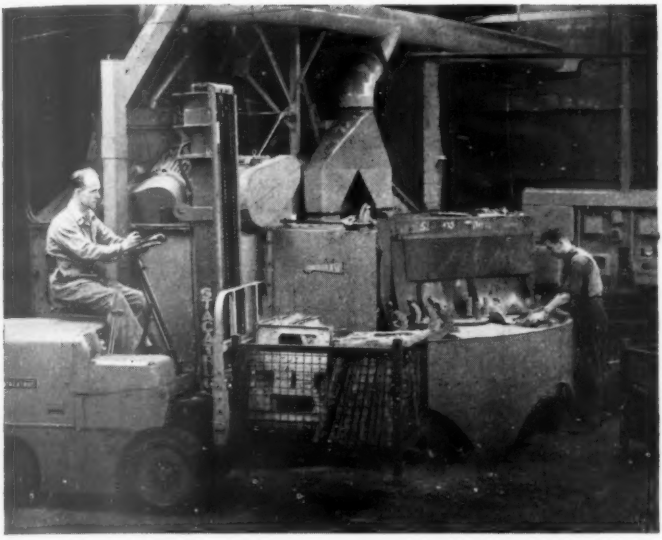


FIG. 14.—*Centriblast shotblast equipment at the works of Robert Taylor & Company (Ironfounders), Limited. Note the delivery and collection of castings by Stacatruc and stillage.*

Beardmore's Parkhead Foundry*

Steel castings of substantial tonnage form a large proportion of the production at the Parkhead Foundry of Wm. Beardmore & Company, Limited. Within a weight range of from 5 to 150 tons the foundry makes castings for ships, turbines, hydro-electric and steelworks plants. The works has always been an important source of supply for the shipbuilding yards of the Clyde and elsewhere, and such parts as the stern, bow hawse-pipe, stern frame and rudder, and propeller brackets have been provided for many Cunard ships, other large passenger liners, and for the Royal Navy's biggest warships.

Patternshop

The patternshop is divided into three bays—a machine bay, building bay, and a bench bay. The floor of the building bay is 120 by 50 ft. and has been specially levelled so that it can be used as a drawing and building board for the stern-frames of ships and other large patterns. The patternshop is fully equipped and is operated both for the manufacture of new patterns and the repair or modification of customers' existing patterns.

Moulding Shop

In the moulding shop, which is 1,000 ft. long, 70 ft. wide, and 60 ft. high, the size and nature of the castings produced necessitate the use of pit moulds. There are 16 casting pits of various sizes, the largest being 45 ft. long, 30 ft. broad, and 12 ft. deep. All employed in the moulding shop are highly-skilled craftsmen.

The company manufactures steel castings in both carbon and alloy steels, and the steel foundry is supplied with metal from the works' central melting shop, which is equipped with Siemens acid-open-hearth furnaces, three of 70 tons, one of 45 tons, and one of 35 tons capacity, and two basic electric-arc furnaces of 20 and 10 tons capacity. The dressing shop is under the same roof as the moulding shop, and is of similar dimensions. Separate sections are maintained for rough and finished dressing, and the shop is fitted with modern equipment. The furnaces for bulk annealing include one which is 40 by 30 by 12 ft. deep; it is oil-fired, and is fitted with a modern control panel from which sequence regulation is possible. There are also fettling sections (including large shot-blast rooms), extensive forge shops, machine shops and laboratories.

The company gives every encouragement to its apprentices. They are allowed a day off each week to attend classes, and bonuses are paid both for academic success and good attendance. The company provides the usual amenities, including canteens and medical services on a scale commensurate with the size and scope of its operations.

* See also JOURNAL (special issue), June 11, 1955, p. 61.

Robert Taylor & Company (Ironfounders), Limited

The output of the foundries (covering some 65,000 sq. ft.) of Robert Taylor & Company (Ironfounders), Limited, is divided between their domestic products and general engineering. The domestic field consists of the production of domestic water boilers, cookers and stoves of the "Tayco" series. A fully-mechanized sand and moulding plant is nearing completion and working on a pilot-plant scale to make plates and boiler bodies although the floor-moulding sections of the foundry are still in use.

Larbert Works

The general engineering castings are split between two foundries located at Larbert and Dunformline. The Larbert works, employing 210 foundry operators, of whom 126 can be classified as skilled and 86 semi-skilled, produces the lighter range of castings from a few ounces to one ton. The quality of castings maintained calls for close control of chemical composition and the bulk of the heavier work is in the "pressure tight" field requiring close-grained irons of low-phosphorus content for cylinder and crankcase work.

FIG. 15.—*Birlec electric heat-treatment furnace of the recirculation type at Robert Taylor's; it is used for the heat-treatment of small castings.*

Machine moulding is carried out by snap-flask, Wallwork, BMM. and Pneulec rollover types, whilst the new mechanized plant will be based on BMM machines. The new sand plant delivers sand to hoppers above each machine station and after knockout, sand is returned to storage hoppers and thence to either the August's or Foundry Equipment mills for reconditioning, being later belt-fed back to the moulding-machine hoppers.

The main foundry is supplied with molten metal from two 40-in. dia. acid-lined cupolas, whilst an EFCO mains-frequency electric furnace is being installed (and should be in operation by mid October) to take care of the specialized alloy-iron requirements and the production of spheroidal-graphite iron.

Coremaking is mainly by conventional methods, drying being carried out in a continuous stove; however, some cores are now made by the CO_2 Process. A semi-automatic, shell-moulding machine made by Fairbairn, Lawson, Combe Barbour, is used for certain items requiring high dimensional-accuracy but it is felt that similar results could be obtained by green-sand methods using snap-flask machines, provided that patterns of similar quality to shell-moulding patterns are employed. One shop is devoted to the production of special alloy irons; here metal is melted in oil-fired Morgan crucible furnaces. This enables the shop also to melt small batches of high-alloy irons, of the Ni-Resist; s-g. iron; Ni-Hard; 30 per cent. chromium types and other materials for special purposes. The production of this shop is floor moulded; much of this line of business was initiated by experimental work for the aircraft jet-engine industry, where castings to fine limits were necessary.

S.-g. Iron Production

The company was the first to be licensed for the production of s.g. iron in Europe; this has amounted to an ever-increasing proportion of its production of 100 tons per week. Rigid control through a well-equipped laboratory sets high standards for both acid-lined cupola and crucible-melted s.-g. iron and the introduction of mains-frequency melting will give even better control of metal compositions, when carburizing high-grade steel scrap. Heat-treatment facilities consist of a Birlec air-recirculating electric furnace for stress relieving (Fig. 15) and a Royce moving-hearth electric furnace for full annealing (this type of furnace was described and illustrated in this JOURNAL, May 9, 1957, p. 579). Further electric furnaces are being installed to handle increased quantities of s.-g. iron and large and small gas-fired muffles are available for general heat-treatment.

Connected with the new development scheme, in progress in the foundry, involving much new plant and mechanical-handling devices, the dressing facilities have been improved by the installation of a Spencer and Halstead table Centriblast machine (Fig. 14) to augment the barrel-type and hand-operated chamber previously employed. A new dressing shop will shortly become available, as floor moulding is transferred to the mechanized plant.

Dunfermline Works

The larger castings for the company are made at their Dunfermline foundry (not to be visited on this occasion), where castings up to 4 tons finished weight are made. This is a self-contained unit employing an A. & W. Smith impeller-type sand rammer and has a production of about 20 tons of castings per week from 30 operators. Most of this work is also of the pressure-tight variety and the same controls are instituted, operating through the Larbert laboratory.

Babcock & Wilcox Limited*

The Renfrew foundries of Babcock & Wilcox, Limited, were rebuilt and reorganized immediately before the 1939 war, and modifications and extensions have enabled the company to keep abreast of changes and techniques. The firm can be regarded as an up-to-date example of a "mixed" foundry engaged on quantity and jobbing production of a wide variety of iron and steel castings.

In the iron foundry, the principal grades of cast iron employed are "standard, high-duty, wear- or heat-resisting," and the foundry has a potential capacity of 20,000 tons a year. The products are mostly for boilers, stokers, cranes and conveyors, and castings up to six tons can be handled. The equipment used is of modern design and includes five cupolas of the balanced-blast type, four being of 4 to 10 tons and one of 1 to 5 tons per hour capacity, the latter being used for producing metal for heat-resisting alloy castings. A mechanized plant is used for the production of stoker links, for travelling- and chain-grate

* See also JOURNAL, June 11, 1955, p. 69.

stokers. These can be made in quantities of up to 30,000 a day on a continuous-casting line also employing mechanical handling from the knock-out station. Other equipment includes two semi-mechanized plants and five impeller-rammer moulding machines, and there is the usual hand-moulding equipment. Castings are cleaned by Wheelabrator treatment and Hydroblast apparatus.

The firm's steel foundry has a potential capacity of 2,000 tons per year, including carbon steels and various alloy steels. It is supplied with metal from two 3-tons capacity and one 15-cwt. electric furnace. Two types of heat-treatment furnaces are in use; one is of the "double-bogie'" type and one of the "top-hat" variety, in the latter there are two bases and a portable cover-type furnace which can be transferred to either base as required. Accurate control of the furnace temperatures is maintained by full instrumentation. The range of castings produced is from a few pounds up to 4 tons, and many devices are used to ensure sound castings. Close watch is kept on the quality of the moulding sand, and metallurgical examination and physical tests of each mixture are part of the regular procedure.

American Letter

Publicity material from the Ford Motor Company, in America, about the Edsel, a new model which is to be offered to the public this month, predict that normal yearly automobile sales in the US will be 8,500,000 units by 1965, with peak years of 10 million cars. That represents a 40 per cent. growth from the 5,900,000 cars sold in 1956. The prediction is based on expected population expansion and the growing income of middle-class families. Extra foundry business is created in the manufacture of this model. In addition to the company's own grey-iron foundries and aluminium pressure-die-casting foundries, 34 outside shops will furnish castings; ten will produce grey-iron parts, four malleable iron, 15 aluminium die-castings, seven aluminium gravity-die-castings, and two zinc die-castings. It is further reported that the new eight-cylinder car will contain 50 lb. of aluminium (39 per cent. more than the average 1957 model) and that more than three quarters of this will be in cast functional components.

Rapid Growth of Buying Power

A survey of industrial buying power in the United States shows that of 76 industries with sales exceeding $1,000,000,000 during 1956, non-ferrous foundries ranked third fastest growing with a 37 per cent. gain over the 1954 comparison period. Non-ferrous castings sales during 1956 exceeded $1,125,000,000. Grey-iron foundries sold 1.8 billion dollars' worth, making them eleventh in the rate of growth with a 28 per cent. increase over 1954. Table I, compiled from information printed in *Foundry*, gives the latest American castings production statistics.

TABLE I.—*Latest US Statistics for Ferrous Castings Sales (in Tons)*

	Grey iron.	Malleable.		Steel.	Spheroidal-graphite iron.
		Ordinary.	Pearlitic.		
May, 1957 ..	995,000	68,400	12,000	147,000	
May, 1956 ..	1,102,000	71,800		159,000	(9,100*)
Gain or loss, per cent.	−10	−5		−8	

* April, 1956.

Foreign Economic Reports

The following extracts have been prepared from recent economic reports emanating from the Export Services Branch of the Board of Trade. In each case, an attempt is made to include mention of trends which may influence foundry business:

Denmark: Trading in the motor-vehicle market has been affected by the increased purchase tax, which was accompanied by the abolition of the previous "dollar premium scheme." Imports of private cars and motor cycles, valued at £2,160,000 were more than double the average monthly value in 1956. Pig-iron production of 55,950 tons, and imports of 56,000 tons were reported.

Belgium: A strike in the metal industry affected steel production, which fell to 449,742 tons, the lowest figure since July, 1955. Sales of non-electric machinery (£1,532,000) were again outstanding, whilst motor vehicles further proceeded to £1,153,000.

Germany: The German Government's plan to cut tariffs up to 25 per cent., on a wide range of manufactured goods, is regarded as being a step in the right direction. Pig-iron production totalled 1,545,963, an increase of 81,863 tons; total production for the first five months of this year was 7,476,096 tons. UK exports to the Federal Republic, in May, totalled £8,000,000, an increase of 7.7 per cent., whilst German exports to the UK fell by 6.3 per cent. to £9,680,000. According to the recently published report of *Verband Deutscher Schiffswerften*, shipyards produced some 1,045,000 gross tons in 1956*, an increase of 125,000.

Italy: Pig-iron production amounted to 197,000 tons in May, being the second highest figure yet reached. Total production for the first five months of 1957 amounted to 831,000 tons, representing an increase of 16.7 per cent. on the 1956 figure. It is reported that the Fiat concern is contemplating sending a further consignment of 1,000 motor vehicles to the United States.

Thailand: It is understood that the market depression continues; this has led the Ministry of Finance to contemplate some economy measures. The Japanese firm, Toyota Motors, Limited, has formed a company in Bangkok for the sale of their low-priced saloon cars. A 10,000 kw. thermal power-plant, running on lignite fuel is to be constructed with financial assistance from the International Co-operative Administration, who are, in addition, supplying 10 1,000-kw. generators for a power-station to be built at Thung Mahamek.

*UK production for the year totalled 1,383,387 tons.

Welsh Iron and Steel Production

A total of 2,238,008 tons of pig-iron was produced in Wales and Monmouthshire during the first 35 weeks of this year, compared with 1,961,687 tons during the corresponding period of last year. Production of steel ingots and castings was 4,227,419 tons, against 3,830,418 tons during the first 35 weeks of 1956.

In August 262,068 tons of pig-iron and 423,832 tons of steel ingots were produced.

In South Wales and Monmouthshire the weekly average for pig-iron was 50,400 tons, against 51,000 tons in July and 40,700 tons in August, 1956. Steel ingot production during August averaged 84,600 tons a week, compared with 94,500 tons in July and 70,700 tons in August last year.

Equipment & Supplies

Scrap-baling press

One of the largest baling presses in Britain has been installed at a cost of £150,000 at the Rotherham works of Steel, Peech & Tozer, a branch of the United Steel Companies, Limited. Supplied by Lindemann Maschinenfabrik GmbH, of Düsseldorf, the machine will compress 3,500 tons of iron and steel scrap each week. By enabling the charging boxes to handle a greater weight of scrap, at each lift, its effect will be to reduce furnace charging times with a consequential increase in production.

The scrap baler consists of a rectangular cast-steel press box, into which up to two tons of scrap are fed from a hopper, the load being compressed hydraulically in three successive operations at a pressure of 5,000 lb. per sq. in. When the scrap has been charged, the hydraulically-operated lid of the press box closes to apply the first compression. Next, two half-pressure rams exert lateral pressure on the partly-formed bale, and finally, it undergoes longitudinal compression from a high-pressure ram set at right-angles to the half-pressure rams. The finished bale is then ejected through a slide in the side wall of the press box on to a conveyor, for transmission to the melting shop, or to a stockpile.

The complete cycle of operations, which is fully automatic, takes 3½ minutes, during which time the hopper has been refilled by a crane magnet, in preparation for reloading the press box.

Pressure for the hydraulic rams is supplied by two multi-stage six-throw pumps, each driven by 140-h.p. motors. The pumps, which are accommodated in a new pump-house, adjacent to the baling press, incorporate automatic cut-off devices for the different pressure stages. They are actuated automatically by means of an electro-hydraulic central-valve control, but there is an auxiliary control in the press-operator's cabin, in case of emergency.

The baling machine is capable of handling all grades of scrap from light to medium heavy. Bale length varies from about 4 to 5 ft. (according to the type of scrap) with a uniform width of approximately 3 ft. and depth of 2 ft. A two-ton bale of these dimensions fits easily into a charging pan, and compares most favourably with the 4 to 6 cwt. load normally carried when charging loose scrap.

Woodturning Lathe

Wadkin Limited, of Green Lane Works, Leicester, have recently re-designed their range of heavy duty woodturning lathes. The latest type R.U.H. (Fig. 1) is built on more substantial lines than previous models. The headstock now incorporates a heavy spindle, mounted on Timken taper-roller bearings. Each end of the spindle is prepared to receive a flange-mounted faceplate and the front end is bored (morse taper) to receive centres. A motor, mounted inside the large headstock, drives through a nine-speed gearbox giving speeds ranging between 100 and 1,900 rpm. Power is transmitted from the gearbox to the main spindle by multiple V belts. Speeds are quickly selected by simple lever movement, on the front of the headstock. The bed is arranged with a sliding motion, by rack and pinion, to give any required width of gap. The largest diameter that can be turned, within the gap, is 5 ft. whilst up to 7 ft. diameter can be turned on the outside faceplate. A travelling slide-tool rest can be supplied, with a lateral movement along the bed, controlled by rack and pinion and a cross motion controlled by square-threaded screw. The tool-post is slotted and can be swivelled in any direction. A spacing collar with ball seating enables tools to be canted at any required angle in relation to the job. Three sizes are being built with 12-, 15- and 18-in. centres respectively, and all machines have a bed length to take up to 8 ft. 3 in., between centres, with the gap-bed closed.

Sand Flowability

Through Foundry Suppliers, Limited, 25a, Cockspur Street, London, S.W.1, George Fischer, Limited, of Schaffhausen, announce the marketing of a new fixture, for the determination of sand flowability, which is mounted on their standard type of sand rammer. The new method simulates a complicated mould, by using the normal test-piece, but with the difference that it carries a flange on the base.

Flowability can be expressed as a percentage (assuming the ideal at 100) by the following simple formula.

$$F = \frac{h_m - h_x}{h_m - h_{100}} \times 100$$

where h_m equals height of specimen with a flowability of M; h_{100} the height of the flanged specimen of a sand with a flowability of 100 and h_x the height of a flanged specimen of which the flowability is sought. In practice flowability is determined by the following method. To find the proper weight of sand to be used, a standard cylindrical specimen is rammed in a precision tube by three blows and the weight of sand needed to give a specimen 50-mm high is noted. An equal weight of loose sand is then carefully introduced into the fixture, rotating it whilst maintaining vertical alignment; the fixture is then put under the sand rammer and the flanged specimen is rammed with three blows, the height (h_x) of the rammed specimen is read on the rammer shaft. After taking into account the values associated with the design (h_m=60 mm.; H_{100}=

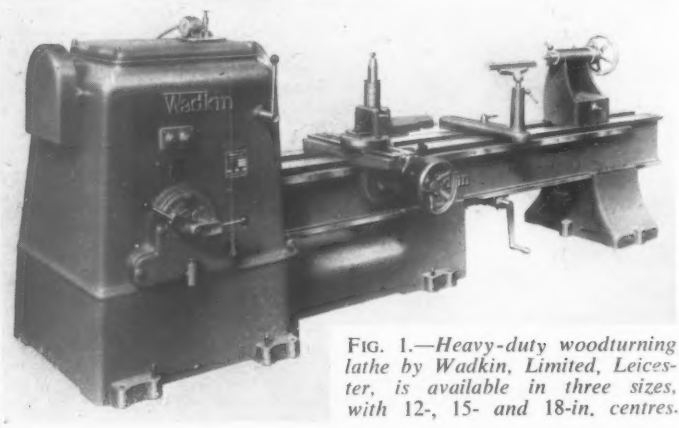


FIG. 1.—*Heavy-duty woodturning lathe by Wadkin, Limited, Leicester, is available in three sizes, with* 12-, 15- *and* 18-*in. centres.*

45 mm.) the equation becomes:—

$$F = 6.66\ (60 - h_x)$$

"Reading-off" of figures is facilitated by a graph supplied with the equipment.

Electromagnetic Filter

The "Boxmag" electro filter, designed for the extraction of iron contamination such as fine iron and oxides from powder, granular, and liquid materials in a free flowing or sticky state, recently has been introduced by Electromagnets, Limited, of Bond Street, Birmingham, 19. The equipment makes use of a specially-designed magnetic circuit, which induces a high-intensity magnetic field, across steel grids in an aperture between the magnet units. The grids are arranged so that the material flowing through them, passes freely, and at the same time contacts the edges of the grid where any extracted ferrous particles adheres, allowing the material being treated to flow through unimpeded, and completely decontaminated.

The field intensity is such that extraction can be carried out at a very-high feed rate, and thus the capacity of the separator, for its relative size, is claimed to be much greater than any other known type of magnetic separator. The equipment is operated by feeding the material through an aperture, and the extracted contamination is cleared by switching off the magnet circuit, the flap valve automatically collapsing and deflecting a proportion of the extracted contamination; the grids are completely cleaned by the operation of a vibrator unit.

Fettling Bench

Newton Collins, Limited, Barford Street Works, Birmingham, 5, have introduced a fettling bench (Fig. 2), marketed as the "Dustrol," which is claimed to provide effective control of air-borne dust from grinding and chipping operations on iron and steel castings. The bench is designed so that in suitable situations it can be exhausted direct to atmosphere or can be coupled to a unit collector or central dust-collecting plant. It can be supplied with either a vice or turntable. A variation is designed for incorporation in a conveyor system, so that the castings can be fettled, in the cabinet, without removal from the track. It is understood that the British Steel Castings Research Association have carried out observations on the unit, and have reported "that with an adequate volume of exhaust air, the bench affords very effective dust control when grinding castings under production conditions."

Activated Limestone

A leaflet received from Foundry Services, Limited, Long Acre, Nechells, Birmingham, 7, discloses that after researches carried out in conjunction with Derbyshire Stone, Limited, a calcium fluoride coating has been successfully applied to metallurgical limestone, resulting in a product with interesting fluxing potentialities. The coating is stated to "stay put" despite handling and weather conditions. The new material is called Foseco Slax, and it is covered by a provisional Patent. Two sizes are available—2-in. lumps for use in cupolas and $\frac{1}{8}$ to 1 in. for the steel industry.

Transfer Pump

Alfred Bullows & Sons, Limited, Long Street, Walsall, have introduced a materials-handling pump, marketed as model 41-8500, which has been designed primarily for supplying spraying guns with direct supplies from the bulk containers, providing a steady flow at high

FIG. 2.—*Standard model of the "Dustrol" fettling bench, manufactured by Newton Collins, Limited, Barford Street Works, Birmingham, 5, is claimed to provide adequate dust control in fettling operations on iron and steel castings.*

rates (up to 150 lb. per sq. in. and 10 gal. per min.). It is claimed that, depending on the application, the unit is suitable for supplying up to at least six spray guns over a medium-length system, provided that the pipe bores are adequate.

Bulkhead-lighting Units

Heyes & Company, Limited, Water-Heyes Electrical Works, Wigan, have introduced new bulkhead-lighting units, known as the "Duolacent" range. These fittings incorporate both concave and convex surfaces, in one glass cover, but with internal prisms only, resulting, it is stated, in better light dispersion from a given wattage with much easier cleaning. At present the unit is made in one size to accommodate up to 100-w GLS lamps. It can be supplied with a base in cast iron, aluminium, or cast brass.

A PRIVATE COMPANY of tool and gauge makers employing 350 at works at Warwick and Lichfield, John Harris, Tools, Limited, is to undertake the Union Carbide Corporation's process of tungsten carbide coating of tools, etc., for which wear life up to 50 times greater than solid carbide is guaranteed. The two concerns have been negotiating for more than two years. A special factory is to be built at Warwick and production is planned to begin in October. Because of the great noise generated, the walls will be one metre thick. The licence, the first to be granted outside the United States, covers Commonwealth countries except Canada; later it is hoped to include Europe.

STUART DAVIS, LIMITED, of Much Park Street, Coventry, announce an addition of a poppet-operated air valve to their range of products, marketed under the trade name of "Red Ring," and has three parts each of $\frac{1}{4}$-in. BSP working either normally open or closed. An outstanding feature of the valve is a safety device which is claimed to prevent damage to the valve-piston or seating in case of bad adjustment of the operating cam, or other element coming into contact with the roller.

Company News

WARNER & COMPANY, LIMITED, refined pig-iron manufacturers, of Middlesbrough—Net profit for the year to June 30, 1957, was £51,814 (£54,878). The dividend is maintained at 25 per cent. but there is a 5 per cent. interim on half the present capital.

COLTNESS IRON COMPANY, LIMITED—The company has declared an interim dividend of 6d. per 6s. 8d. share, or 7½ per cent., in respect of the year ending September 30. For the previous year a single payment of 15 per cent. was made. The directors state that it must not necessarily be assumed that the total dividend for the year will be in excess of last year's.

HEAD, WRIGHTSON & COMPANY, LIMITED, iron and steel founders and engineers, etc., of Thornaby-on-Tees —An extraordinary meeting is called for October 9 to approve the proposed scrip issue and share split. The directors intend to pay a 5 per cent. interim dividend on the increased capital in January, and expect that the final for the year to January 31, 1958, will not be less than 10 per cent.

CHURCHILL MACHINE TOOL COMPANY, LIMITED—The dividend is maintained at 10 per cent. on the capital increased by a 33⅓ per cent. scrip issue. The directors state that they expect next April to be able to recommend a final of not less than 15 per cent. for 1957. The 1956 final on the smaller capital was 20 per cent., making the equivalent of 22½ per cent. for the year on the present ordinary.

HORSELEY BRIDGE & THOMAS PIGGOTT, LIMITED, constructional engineers and ironfounders, of Tipton (Staffs)—The offer to acquire the ordinary capital of Mechans, Limited, constructional engineers, etc., of Glasgow, has been accepted by holders of over 90 per cent. of Mechans' shares, and has accordingly become unconditional, subject to the London Stock Exchange granting permission to deal.

BAKER PERKINS, LIMITED, engineers, iron, steel, and brass founders, of Peterborough—To cover the first stage of future development and expansion, application is being made to the CIC for consent to a rights issue of 231,336 shares. To raise this and further capital, application is also being made to the London Stock Exchange for a quotation for the equity capital. As a preliminary it is proposed to give the "A" ordinary stockholders full voting rights and to amalgamate ordinary and "A" ordinary into one class.

SILENTBLOC, LIMITED, manufacturers of anti-vibration devices, of Crawley (Sussex)—The right to manufacture a new form of suspension for cars and heavy vehicles has been secured. The directors believe that it may have far-reaching effects upon the future prosperity of the company, but benefits are not likely to be reflected in the accounts for a year or two. Even though group trading profits contracted from £414,654 to £345,659, they are the second best in the history of the company. The dividend remains at 25 per cent.

DORMAN SMITH HOLDINGS, LIMITED, electrical equipment and ceramic manufacturers, etc., of Salford (Lancs)—The ordinary dividend is raised from 6 per cent. to 12½ per cent. for the year to March 31, 1957. Group profit is £131,351 (£103,118), and net profit is £59,451 (£51,145). Mr. T. Atherton, chairman, states that since the close of the financial year Hindustan Klockner Switchgear (Private), Limited, has been formed with registered offices in Bombay to manufacture certain products of British Klockner Switchgear (a wholly owned operating company) in India for the Indian market.

Russian Machinery Order

A consortium formed by David Bridge & Company, Limited, Crompton Parkinson, Limited, Lancashire Dynamo Holdings, Limited, Mather & Platt, Limited, and Francis Shaw & Company, Limited, under the name of Rustyfa, Limited, has secured orders for the supply of machinery to Russia valued at £7,500,000. The machinery is for a new tyre factory being built at Dnepropetrovsk in the Ukraine.

Deliveries of the machinery, which will be paid for in sterling, are scheduled to begin in early 1958, and should be complete by 1960. The order covers the main basic plant of the factory, including machinery for mixing and extruding compounds, tyre preparation, and vulcanization, the production of which will be the responsibility of David Bridge and Francis Shaw. Lancashire Dynamo Holdings will supply the electric motors for the large machinery.

Mather & Platt will produce the dipping, refrigeration, and water circulation plant, and Crompton Parkinson the switchgear and electric motors for auxiliary equipment.

Vickers Plans to Raise £29,000,000

Plans to raise £29,000,000 of new capital have been announced by Vickers, Limited. It is being raised in two parts:—An issue at 33s. per share of 11,772,756 £1 ordinary shares on a two-for-five basis, and an offer at £96 per cent. of £10,000,000 6 per cent. unsecured loan stock, 1977-80, to existing members, debenture, and loan stockholders. On the increased ordinary capital the directors expect to maintain the final dividend at 7½ per cent. for the year to December 31, 1957.

For the first time, Vickers has issued a half-yearly profit statement. Taking into account the increased amount of distributed profits tax which the larger distribution will entail, the profit after taxation for the first half of the year is given at £2,690,000 following £6,180,000 for the full year.

Sales for the six months to June 30 last were £94,900,000, as against £163,000,000 for the whole of the preceding year. Stock-in-trade and work-in-progress is £4,000,000 up on December last, and orders in hand reached £337,000,000 (£329,000,000).

Forthcoming Events

SEPTEMBER 30

Incorporated Plant Engineers

West & East Yorkshire branch:—"Safe Use of Electricity," by S. J. Emerson, 7.30 p.m., at Leeds University.

OCTOBER 2

Institution of Production Engineers

Nottingham section:—"Principles and Applications of Pneumatics in Production," by F. Kay, 7 p.m., at the Victoria Station Hotel.

Institute of British Foundrymen

Southampton section:—"Thoughts on the Development of the CO_2 Process," by A. Talbot," 7.30 p.m., at the Technical College, St. Mary's Street.

OCTOBER 3

Institution of Production Engineers

Reading section:—"Some Aspects of Automation," by A. L. Stuchberry, 7.30 p.m., at the Great Western Hotel.

OCTOBER 4

Ipswich and Colchester section:—"Automation—Development of Transfer Equipment," by A. J. Sephton, 7.30 p.m., at the Britannia Works canteen, Davey, Paxman & Company, Limited, Colchester. (Combined meeting with the Colchester Engineering Society.)

"Tricks of the Trade"

By "Jacques"

An interesting side to jobbing foundrywork is the variety of loose patterns that come in by the back door on to the "to-be-given-out heap." For a few decades, there have been few moulding shops without a pile of these to deal with. Surprising too, how the awkward-to-mould patterns disappear underneath or out of sight at the back. In a loose-pattern bench or light floor-moulding section where the steady old-time craftsmen have stacks of work to go along with, really "tricky" patterns have been known to find their way back to the start, to merit an inquest as to who and what. Moreover, where discipline has deteriorated with the passing of the years, or perhaps, where the "cock moulder" has lost the urge to "crow," a shrewd foundry manager may have to decide to stick to the easy ones, and "sub-let" the "menace-to-good-shop-relations" (*via* the telephone), to a "friend" of his (most likely he himself got it that way). This is a move as old as the industry, one which started the popular ancient phrase, "passing the buck."

Quite often such a pattern is a masterpiece of unconscious ingenuity on how to avoid easy moulding, but no doubt a prize-winner as regards the first cost.

Sometimes such patterns are put into circulation by small engineering concerns, who probably hand over the drawings for the pattern to the first caller with the easy price, could be an undertaker's canvasser in the winter and early spring, a man without any foundry "know-how." Conditions not conducive to early delivery.

It is much more satisfactory, and cheaper in the long run, to deal with established and reputable master patternmakers, the majority of whom are in regular and close contact with moulding difficulties and know how to take out anticipated snags and hazards, that are so obvious to the experienced eye. Patternmakers with actual moulding experience can usually offer more than one set-up, to break down a design, and make it the proverbial "flyer."

FIG. 1.—*Casting requiring four-parted moulding for manufacture, and, Fig. 2, the pattern as received, showing the large number of parts into which it was divided.*

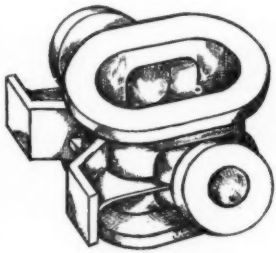


FIG. 1.

FIG. 2.

FIGS. 3 TO 5.—*Stages in mould production and assembly; Fig. 3, bottom and middle section moulds rammed up; Fig. 4, three of the mould sections carrying the pattern (with the top-part lifted off), and Fig. 5, the reassembled mould, after coring.*

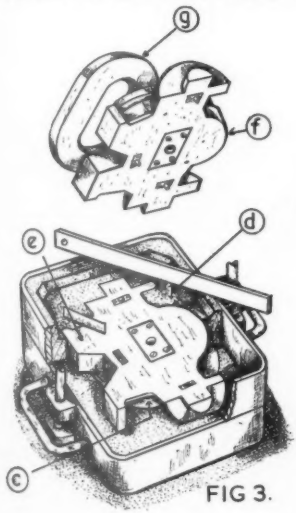


FIG 3.

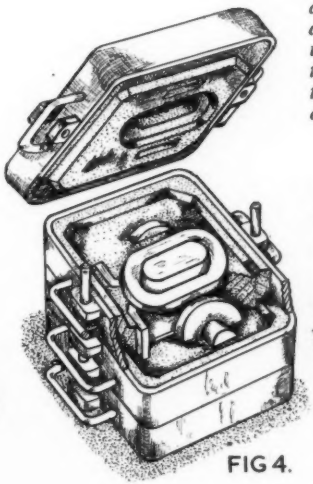


FIG 4.

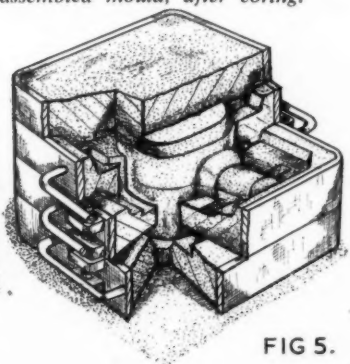
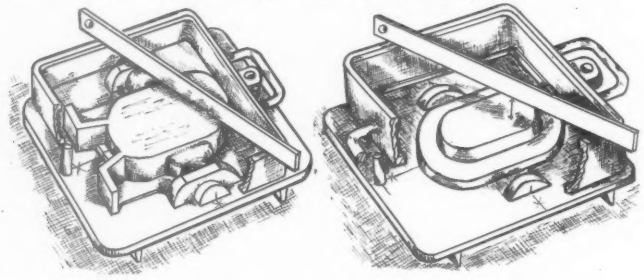


FIG 5.

"Tricks of the Trade"

This article is based on the four-parted casting, shown in Fig. 1. Production from the pattern shown in Fig. 2, using "just-too-deep" moulding boxes, requires more than the average moulding talent, for making the stepped or slip joints that enter into it. An obvious error in the patterns is the loose open flange (*a*), prohibitive to a flat back start, which makes it necessary to ram up a middle section (*b*) first and then joint this down to a level face to take the open flange. A separate replica flange (*c*) will provide a flat back start, this is rammed up in the usual way, and rolled over to take the middle section of the pattern.

FIG. 6.—*Method suggested for mounting the pattern-on-plates.*



The second-half middle of the pattern is then put into place, and rammed up, this "too-deep" box again requires a stepped joint, as shown at Fig. 4. This cut-away sketch also shows top part lifted off, the two middle sections, and the bottom part moulds, prior to drawing out the pattern sections the reverse order to ramming up. Fig. 5 shows the complete reassembled and cored up moulds as made from the four-parted loose pattern, each separate stepped joint will be noted, as also the necessity for first-class loose-pattern moulding technique. A time-consuming job, so unnecessary with a different approach to the pattern design in the first place.

Recommended Method

A close examination of the casting as shown in Fig. 1 would indicate that one half middle and one flange is all that is required to put the job on to two plates and into the semi-skilled production, two half moulding boxes are also required; these are machined down to the exact depth of the middle sections of the pattern. Fig. 6 shows the arrangement. The other method is, of course, to block out the middle sections with a print and reproduce the pattern sections in block corebox to match, the extra cost of pattern and core making ruled this method out.

FIG 7.

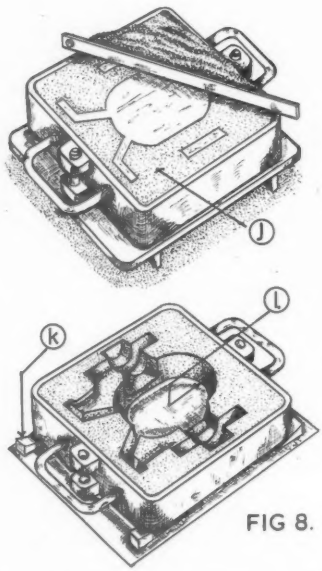


FIG 8.

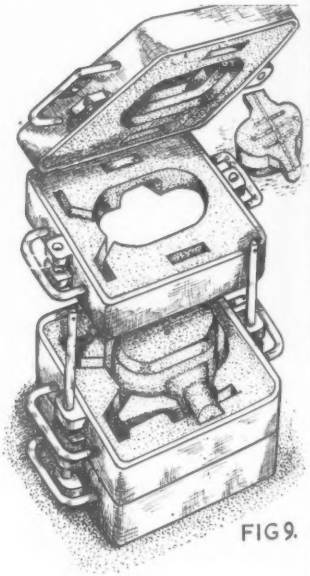


FIG 9.

FIGS. 7, 8 AND 9.—*Simplified method of moulding resulting from mounting the pattern parts on plates.*

Fig. 3 shows the first bottom and middle section moulds after being rammed up, the deeper-than-the-patterns middle box part is shown (*d*), the below-the-box joint will be noted, as also the level face (*e*).

The arrangement as shown in Fig. 6 was by far the simplest and least expensive, and also provided four straight-ram-up flat-back moulds, as shown complete in Fig. 9.

Shown in Fig. 7 is the first (bottom) section of the four moulds, the flange, fixed on a plate, to datum lines that register with those on the plate for the mid-parts, is rammed up in the usual way and rolled over, two moulds from each of the two plates are required.

Fig. 8 shows the two rammed up mid-parts (flat-backs), the top sketch (*j*) illustrating how the mould faces are strickled off level to the pattern and the machined-down box-part. The moulds are rolled over on to a level plate and the pattern drawn out. The mould is raised on wedges (*k*) to permit any feather edges on the joint (*l*) to be removed, also any radius required can at this point be smoothed on.

The first middle section (lower sketch, Fig. 8) is put in position on to the first bottom-section mould, Fig. 7, and the job cored up at this stage. Another middle section mould is then rammed up as also another flange mould for the top, placed in position, to complete the job as shown in Fig. 9.

The alterations to the pattern plus the machining charges for the box parts have been amply justified, and made a " teaser " pattern into a simple job, with one per hour as a minimum, as against three in two moulding " sessions," practically five hours each. This article may stimulate other ideas for taking out the hazards associated with wrongly planned patterns, as any method which simplifies loose pattern moulding technique is well worth the time and trouble.

Centri-spun Weld-neck Flanges

Serious delays in the completion of installations for chemical, oil, nuclear and other engineering plant, during recent years, have frequently arisen from shortage of suitable flanges for pipe coupling. In some instances, particularly where the installation is intended to operate under conditions of low pressure, sand-cast flanges are permissible. However, in many cases, usually for reasons of uniformity of mechanical properties and inherent soundness, the designer has specifically provided for the use of the forged variety. Whilst at one time insistence on forged flanges was sound practice, this inflexibility to-day is frequently unnecessary.

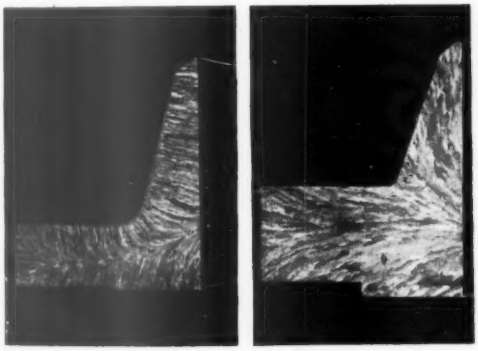


FIG. 1.—*Polished and etched sections of centri-spun weld neck flanges showing the directional solidification and absence of porosity (left, 10-in. dia. centri-die-cast and, right, 12-in. dia. centri-sand-cast flange.*

At the centri-spinning foundry of Firth-Vickers Stainless Steels, Limited, Sheffield, research teams have recently carried out a series of tests, proving conclusively that flanges produced by the centri-spinning process are entirely suitable for applications hitherto necessitating forging.

Tests

For investigation purposes, tests (see Table I) were carried out on flanges made by two methods, the first, involving a 12-in. weld-neck flange and an 8-in. centri-sand-spun flange, and the second, a 10-in. weld-neck centri-die-spun flange. All three flanges were heat-treated and the 12-in. and 8-in. flanges machined all over, the 10-in. flange being machined as far as the neck only, leaving this portion in the spun condition. All three flanges were radiographically examined and proved to be sound. The 12-in. and 10-in. flanges were then sectioned to give four half-rings, one half-section of each flange being polished and etched (Fig. 1), the macro-structure indicating sound directional solidification with no evidence of porosity.

TABLE I.—*Detailed Results of Test Carried Out on Centri-spun Weld-neck Flanges.**

12-in. centri-sand weld-neck flange.	Yield, tons per sq. in.	Maximum stress, tons per sq. in.	Elongation, per cent.	Reduction of area, per cent.
Longitudinal tensile ..	16.5	36.8	30	33
Circumferential tensile	16.5	38.4	38	40
Flange circumferential tensile ..	16.5	39.5	40	45
Radial tensile ..	21.0	46.6	45	47

Impact Results.	
Circumferential impact	45/54/53 ft. lb.
Circumferential (flange) impact ..	60/60/58 ft. lb.
Radial impact	54/54/40 ft. lb.

10-in. centri-die weld-neck flange.	Yield, tons per sq. in.	Maximum stress, tons per sq. in.	Elongation, per cent.	Reduction of area, per cent.
Longitudinal tensile ..	20.0	48.0	40	43
Circumferential tensile	18.3	42.2	41	36.5
Radial tensile ..	21.0	48.0	37	30

Circumferential impact	37/39/40 ft. lb.

* Analysis: C, 0.07; Si, 1.48; Mn, 0.94; S, 0.014; Cr, 18.0; Ni, 8.0 and Ti, 0.74 per cent.

Brass Embossing Dies

The British Consulate-General at Cleveland, Ohio, USA, have reported that Stanley Greetings, Inc., 605, Patterson Boulevard, Dayton, 1, Ohio, are interested in approaching a UK firm of die manufacturers, to whom they could air-mail drawings of the required design, and who would process a die and despatch by air-mail. The estimated value of these dies would be in the order of $6,000 per annum. Details are available from the Export Services Branch of the Board of Trade, Lacon House, Theobalds Road, London, W.C.1, quoting reference ESB/21454/57.

News in Brief

THE NEXT BRITISH PLASTICS EXHIBITION AND CONVENTION, is to be held at Olympia, London, June 17-27, 1959; it is to be renamed the International Plastics Exhibition & Convention.

EMPLOYEES of the Yale and Towne Manufacturing Company's British Divisions at Willenhall and Wednesfield (Staffs) travelled by special train, on September 14, for the firm's outing to Blackpool.

JOHN M. RODGER & SON, LIMITED, are planning to extend the patternstore and to provide a changing room and showers at Kyle Foundry, 14, Smith Street, Ayr, Scotland, at a cost of £1,500.

K. & L. STEELFOUNDERS AND ENGINEERS, LIMITED, Coborn Works, Letchworth, Herts, are planning to erect a steel-castings finishing factory on a 15-acre site off Colchester Road, Halstead, Essex.

AN EXHIBITION OF CASTINGS made by Robert Taylor & Company (Ironfounders), Limited, will take place at the Kent Hall of the St. Andrews Halls, Charing Cross, Glasgow, from November 12 to 15.

MATERIALS HANDLING EQUIPMENT (GREAT BRITAIN), LIMITED, sole concessionnaires for the Irion side-operating fork-lift carriers, announces removal to 40a, Dover Street, Piccadilly, London, W.1.

RHODEN PARTNERS, LIMITED, design and development engineers in mechanical engineering, have recently removed from North Row, London, W.1 to larger premises at 29, Park Crescent, London, W.1. (Tel. LANGham 7488).

BRITISH ATOMIC-ENERGY POWER STATIONS may obtain a useful supply of thorium from Nyasaland, it is stated by the Nyasaland Government in their 1956 report. The ore, monazite, has been located along the shores of Lake Nyasa.

THE THIRD PROGRAMME in a new series, "Watch Your Step," which begins in the BBC Light Programme on October 5, will feature employees at a blast furnace at the Dagenham Works of the Ford Motor Company, Limited.

A MOBILE SERVICE TEAM for the two diesel companies, Petters, Limited, Staines, and J. & H. McLaren, Limited, Leeds (both members of the Brush Group, Limited), has begun a six-week tour in Europe. The team will visit Holland, Germany, Switzerland, and Belgium.

A FURTHER ORDER for two water turbines for Table Rock Power Station, Missouri, USA, has been awarded to the English Electric Export & Trading Company, Limited, London, W.C.2, by the US Army Corps of Engineers. The contract is worth about $1,400,000.

YORKSHIRE ENGINE COMPANY, LIMITED, point out that all twelve of the Janus 400 h.p. diesel-electric shunting locomotives for ICI are to be delivered by mid-1959, and not merely the third as was recorded incorrectly in a paragraph on this page in the September 12 issue of the JOURNAL.

THE ORDER-BOOK of the North Eastern Marine Engineering Company, Limited, Wallsend, has reached record proportions since the receipt of contracts worth £2,250,000 for propelling machinery and Scotch boilers. The company is a member of the Richardsons, Westgarth group.

THROUGH its Canadian Company, Simon Engineering Companies of Canada, Limited, Simon Handling Engineers, Limited, Stockport, has received contracts from the Canadian National Harbours Board totalling more than $1,000,000 (about £375,000). The company is to supply eight large pneumatic suction plants for discharging grain from ships.

WITH AN AUTHORIZED CAPITAL of £10,000, Lister Blackstone Rail Traction, Limited, has been registered as a private company. Its purpose is to acquire the selling rights of all rail traction engines, machinery, and equipment manufactured by R. A. Lister & Company, Limited, Dursley (Glos), and/or Blackstone & Company, Limited, Stamford (Lincs).

THE 21ST ENGINEERING, MARINE, WELDING AND NUCLEAR ENERGY EXHIBITION, which closed on September 12, has been reported an outstanding success: buyers from 68 overseas countries attended the exhibition. A change of date has been announced for the next exhibition, which will be held from April 16 to 30, 1959, instead of the autumn of that year.

KEITH BLACKMAN, LIMITED, announce the inauguration of their new acoustic laboratory at the company's head office and works at Tottenham, London, N.17. Designed to permit the accurate study of industrial noise generation and its suppression, the laboratory is considered to be one of the most scientifically designed and best-equipped chambers in existence today.

ACCORDING TO *Target*, Ashmore, Benson, Pease & Company, Limited, of Stockton-on-Tees, have changed over almost completely to the CO_2 Process. Advantages have been gained through the elimination of the need for drying the moulds. Whilst the size of casting to be made was often governed by mould stove capacity, now, it is solely the crane lifting power which determines the limit.

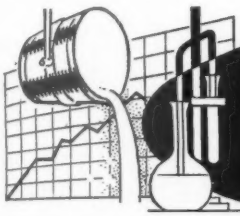
A CONTRACT valued at nearly $1,000,000 dollars has been placed with Thomas Robinson & Son, Limited, Rochdale, by Republic Flourmills Incorporated, a newly-formed company in the Philippines. Achieved in the face of world-wide competition, the contract covers the design and equipment of the first flourmill to be erected in the Philippines. It is claimed that when completed it will be the most modern plant of its type in the world.

CONSIDERABLE HELP is now being extended by British commercial-vehicle manufacturers and their agents abroad in training native boys of East and West Africa in the service and maintenance of diesel-engined trucks. Two companies, Leyland Motors, Limited, and Albion Motors, Limited, are now shipping sectioned diesel-engines and other units for use in the training schools which have been set up by their agents in Kenya, Ghana and Nigeria.

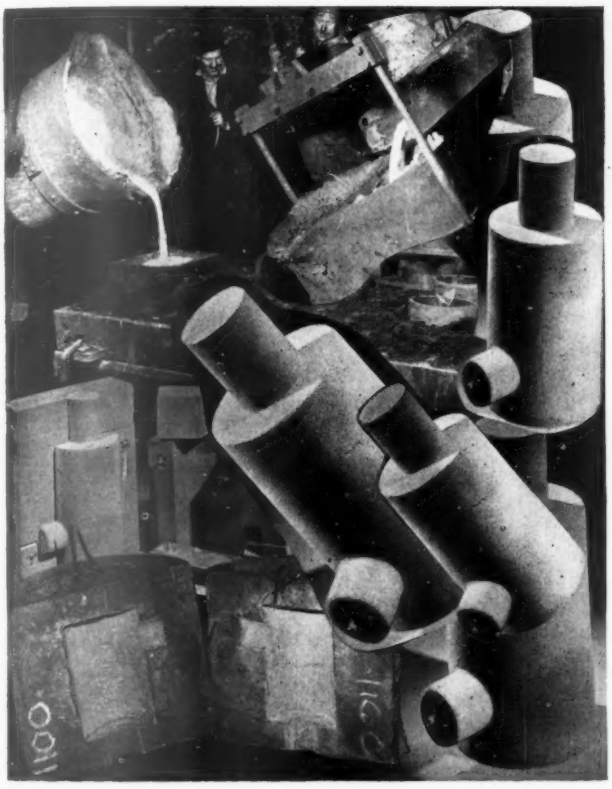
Mr. J. C. HOWARD, director of Electric Furnace Company, Limited, has recently returned from South Africa, where the largest electric arc furnace in the Southern hemisphere has been put into operation. He reports that from the start, the furnace has been working continuously. The average weight of the charge has been 72 short tons, the electrical rating being 15,000 kva. During the first four weeks the total production was about 4,500 tons of steel.

A. WIGLEY (BELPER), LIMITED, of Horsley Woodhouse, Derbyshire, aluminium smelters and ingot manufacturers, announce that their associated company, North Derbyshire Metal Products, Limited, of the same address, has commenced operation as manufacturers of aluminium powder. A new plant has been erected employing the most modern methods of building construction, and special equipment has been installed for the production of air-blown aluminium powder.

(*Continued on page* 384)



Actual Foundry Tests



SPECIALISED SERVICE

After the initial work in the chemical and sand laboratories SPECIALISED TESTING, both on routine products as well as research, goes forward for actual foundry trials at our experimental foundry.

The illustrations feature a test casting, showing core box and cores, designed to be a severe test on any sand mix. Completely surrounded by two to four inches of metal the seven inches by five inches core is vented only through the two inches of top projection. The metal is run in to achieve maximum wash against the side boss.

The core box is constructed to allow for top or bottom ramming, or for core making in two halves. In this way can be tested box varnishes, flowability of sands, and resistance to sag or green deformation, together with the efficiency of core jointing media.

All export enquiries should be addressed to our export organisation:
MOREP (Manufacturers' Overseas Representations),
Carlton Chambers, Halifax, England
Cables: Morep, Halifax, England

Wm. ASKE & Co. LTD

"Baltiseed"
FOUNDRY SAND-BINDERS

VICTORIA WORKS · WATERSIDE · HALIFAX
Telephone: Halifax 60661/2 **Telegrams: Baltiseed, Halifax**

J.J.M.

News in Brief

(*Continued from page* 382)

AT THE OCTOBER LUNCHEON MEETING the Non-Ferrous Club is to have as its guest speaker, Mr. R. Lewis Stubbs, of the Zinc Development Association, who will be speaking on "Free Trade in Non-Ferrous Metals?" It is expected that he will have something to say about the proposed free trade area and his work in conjunction with the European Die-Casting Committee should enable him to give some interesting observations on this subject. The luncheon will be held on October 2 at the Queen's Hotel, Birmingham, 12.15 for 12.45 p.m.

THE PURCHASING OFFICERS' ASSOCIATION has published a supplement to its *List of Members*, issued in May, 1956. The supplement, as at July 1, 1957, lists members elected since May, 1956, and gives details of their companies; it also lists changes of appointments and deletions which have taken place since that date. Copies may be obtained, price 5s. 0d., from the Association at Wardrobe Court, 146a Queen Victoria Street, London, E.C.4, and a small number of the original *List* are still available at 10s. 6d. each, or 15s. 0d. for the *List* and supplement combined.

A CORROSION EXHIBITION is to be held at the Royal Horticultural Society's Old Hall in Vincent Square, Westminster, London, S.W.1, from October 15 to 17. Among the 50 firms who are exhibiting anti-corrosion products, British Oxygen Gases, Limited, will be showing their range of Saffire oxy-acetylene flame cleaning equipment, together with specimens of work which has already been carried out. Delegates to the corrosion convention, which is being run concurrently with the exhibition, will be visiting the premises of British Oxygen Gases, Limited, at Cricklewood.

A REPLICA OF A BRASS FOUNDRY has been opened at the Science Museum in Newhall Street, Birmingham, to commemorate one of the oldest trades in the city. At one time Birmingham was the world centre for brass and from the city came many fittings for countless purposes. The exhibit at the Science Museum depicts a typical brass foundry of about three decades ago. Materials and apparatus for the foundry were supplied by a number of local firms and technical advice was given by a Smethwick firm of brassfounders, Jones Brothers.

ELLIOTT BROTHERS (LONDON), LIMITED, instrument manufacturers, of London, S.E.13, and the Fairey Aviation Company, Limited, Hayes (Middx), are to join with Atomic Power Construction, Limited, in the design and building of nuclear power stations. The Atomic Power Construction group, which comprises Richardsons, Westgarth & Company, Limited, International Combustion, Limited, Crompton Parkinson, Limited, Holland & Hannan & Cubitts, Limited, and Trollope & Colls, Limited, is the fifth and most recently formed British nuclear power station construction group.

BRITISH TRANSPORT COMMISSION announce that the Harbours Charges Scheme, lodged with the Transport Tribunal in July, 1956, which has been the subject of discussion with representatives of the users of the harbours, is to be discarded and that a new draft scheme of an interim character has been prepared after consultation with the principal national organizations of shipowners, importers and exporters. Copies of the draft scheme which has been lodged with the Tribunal may be obtained from the British Transport Commission (Room 360), 222, Marylebone Road, London, N.W.1, or from the chief commercial manager, 87, Union Street, Glasgow; price 1s.

MR. G. R. BUCKLEY, assistant managing director of Stanton Ironworks Company, Limited, welcomed parents at the firm's eighth annual parents' day on September 14. He said that besides giving the boys technical training, the company felt it had a duty to develop the character and interests of apprentices so that they could get the fullest enjoyment out of life. He added that they needed the fullest co-operation of the parents. He said they would continue to send boys both to Brathony Hall and the Outward Bound School. Sixteen boys were nearing the final stage of the Duke of Edinburgh's award scheme and another would start in a month's time. The parents were shown examples of the boys' work and saw a film of the Outward Bound School activities.

LANE & GIRVAN, LIMITED, the Bonnybridge firm of stove and cooker manufacturers, have announced the introduction of a decorated cast-iron vitreous enamel cooking ware, made possible by a process which is claimed to be the first of its kind. Hitherto, the process has been confined to china and pottery only. The extension to cast-iron represents, after many months of intensive research, a distinct technical advance. The patterns cannot wear off, and will last as long as the dishes themselves. The various designs available, ranging from traditional to modern styles, were created by Mr. Robert A. Stewart, lecturer in industrial design at the Glasgow School of Art. Of various shapes and sizes, each unit in this new oven-to-table ware has a flat machine-ground base, which makes it ideal for all types of cooking.

BRITISH TRANSPORT WATERWAYS are to carry out improvements costing over £260,000 on the Weaver Navigation, in the North-western Division. The programme is part of the British Transport Commission's £5,500,000 development plan for their principal inland waterways, and is designed to enable this short but important water route to cater for the increasing use of sea-going vessels. Well over half-a-million tons of traffic a year is carried on the Weaver Navigation, which comprises the Weston Canal and the River Weaver, and which links the industrial centres of Winsford and Northwich with the Manchester Ship Canal and the River Mersey. The programme includes:—bank-protection and navigation works (£126,800); mechanization of locks and sluice improvements (£33,100); dredging plant (£64,000); and workshops and other premises (£36,900).

FIELD MARSHAL VISCOUNT MONTGOMERY OF ALAMEIN declared open the Raleigh No. 3 factory at Nottingham on September 11. This, the firm's largest single expansion in its 70 years' history which has been erected at a cost of £5,000,000, will increase productive floor space by 50 per cent., bringing the area of the firm's Nottingham plant up to 60 acres. The new building covering a 20-acre site and one-third of a mile long, is the largest single factory building in the world for the manufacture of cycles or cycle components. It is also one of the largest single-storey buildings in Great Britain. Half the cost has been spent on clearance of the site and building, and the other half on equipment and machinery. The new buildings will be devoted to the manufacture of Sturmey-Archer variable gears and Dynohubs. The firm makes over 1,000,000 cycles and 2,000,000 gears a year and exports over 70 per cent.

GENERAL ELECTRIC COMPANY, LIMITED—Mr. Frank Winstanley, who has served the company for 59 years, has not sought re-election to the board. Sir Toby Low has been elected a director.

"Isn't everything a shocking price Mrs. F!".....

The shocking price of everything is (or should be!) a worry to everyone in industry. Platts are proud to know that their continued policy of supplying non-ferrous metals of the highest quality at genuinely competitive prices at least offers some resistance to the constant upward trend of most raw materials.

ask today for a quotation

Platt METALS LTD

GUNMETAL, BRONZE, BRASS, ZINC AND LEAD INGOTS

PLATT METALS LTD., ENFIELD, MIDDLESEX. HOWARD 3351 ★

Personal

ADMIRAL ROBERT SPENCER WARNE has been appointed a director of Ransomes & Rapier, Limited.

Mr. A. J. PEECH has been appointed general managing director of the United Steel Companies, Limited, in succession to the late Mr. GERALD STEEL.

Mr. J. H. BROMFIELD has been appointed a director of English Steel Corporation, Limited. Mr. J. C. MATHER has relinquished his seat on the board.

Sheepbridge Stokes, Limited, a subsidiary of Sheepbridge Engineering, Limited, announce that Mr. J. J. CARROLL has joined the company as manager of the single cast ring foundry.

Mr. P. E. G. BATES has been appointed commercial manager of Bristol Aircraft, Limited. He succeeds Mr. F. E. DAVEY, who has relinquished the position which he held for 15 years.

Mr. G. M. HARVEY has been appointed managing director of British Oxygen Wimpey, Limited, with effect from September 1. He relinquishes his appointment on the company's board as design manager.

Mr. C. P. AUGUR, librarian of the British Cast Iron Research Association, received the essay prize at the annual conference of the Library Association at Harrogate last week. His subject was "Automation in Libraries."

Metropolitan-Vickers Electrical Company, Limited, has appointed Mr. W. C. CLEGG, assistant purchasing agent, to be purchasing agent as from July 29, replacing Mr. G. T. KING who retired from executive duties on that date.

Mr. L. A. ROCHEFORT and Mr. A. C. COOPER, chief executives of I.T.D., Limited, travelled to the USA on September 17, to visit units of Clark Equipment International C.A. consequent upon the recent acquisition of a third interest in I.T.D., Limited, by Clark.

Mr. ROBERT STIRLING, who has been instructor to apprentice moulders since 1919 with Smith & Wellstood, Limited, stove and cooking equipment manufacturers, etc., of Bonnybridge (Stirlingshire), has retired after 55 years' service with the company. Mr. Stirling is 70.

Mr. H. M. HENDERSON, general sales manager of the United Steel Companies, Limited, is leaving this country to take charge of the company's interests in Patchett Steel Construction (Pty.), Limited, of Cape Town. Mr. R. P. CRAWSHAW, who becomes general sales manager on October 1, will continue his duties as the chief purchasing agent of United Steel.

Harold Andrews Sheepbridge, Limited, a subsidiary of Sheepbridge Engineering, Limited, announce that Mr. A. E. AKERMAN has been appointed sales director of the company. Mr. Akerman who previously worked for the group in the capacity of sales representative will be responsible for the marketing of Hagco cylinder liners and Flocast rod and tube. Mr. B. C. GOODWIN remains as sales manager.

Lord BILSLAND, chairman of Scottish Industrial Estates, Limited, from its inception in 1937 until he retired in 1955, was presented with his portrait in oils at a dinner in Glasgow on Tuesday. The portrait, the work of James Gunn, ARA, is the gift of tenants, consultants, and staff of the company. Lord Bilsland is president of the Scottish Council (Development and Industry). A governor of the Bank of Scotland, he is a director of Colvilles, Limited, John Brown, Limited, John Brown & Company (Clydebank), Limited, and a number of other companies.

Mr. ERIC E. JONES, group commercial director of the Solartron Electronic Group, Limited, Thames Ditton (Surrey), and vice-president of Solartron Incorporated, of Los Angeles, flew to the United States last week. While there he will review the progress of Solartron Incorporated, and further its sales expansion policy, make arrangements for the manufacture under licence of the Solartron Electronic Reading Automation (ERA), now in production in England, implement the policies of the recently formed Solartron-Rheem, Incorporated, and the scientific and technical agreements between the Solartron Electronic Group, Limited, and the Consolidated Electrodynamic Corporation of Pasadena, California.

Mr. E. D. ROBINSON, formerly assistant manager of London area sales office, of the Northern Aluminium Company, Limited, London, W.C.2, has taken up the appointment of area sales manager in charge of the Manchester office in succession to Mr. D. A. CORBETT-THOMPSON, who has been appointed sales manager in charge of export sales. Mr. M. BRIDGEWATER, becomes manager of the sales development division, Banbury, with effect from September 30. He succeeds Mr. E. D. ILIFF, who has been appointed sales manager in charge of sales development, advertising, and publicity. Mr. Bridgewater was previously in charge of the building and construction section of the sales development division.

Obituary

Manager of the Excelsior Foundry Company at Sandiacre for nearly 50 years, Mr. HAROLD TAYLOR has died, aged 71.

The death has occurred of Mr. GEORGE WILLIAM TAYLOR, who, until his retirement this year, had been in charge of the training workshop of Samuel Fox & Company, Limited, steel manufacturers and rollers, of Sheffield, since 1945. He had been with the company for 42 years.

The death is announced of Mr. VICTOR ALEXANDER PATTERSON, deputy chairman and managing director of J. & E. Hall, Limited, the Dartford (Kent) engineers and ironfounders. He was also a director of Todd Oil Burners, Limited. Mr. Patterson was a past-president of the Engineering and Allied Employers National Federation.

The death has taken place of Mr. J. B. NEWSHAM, formerly a director of the Premier Steel Company, Limited, a subsidiary of the Neepsend Steel & Tool Corporation, Limited. Mr. Newsham, who retired in 1945, began his commercial career in the Continental department of Thomas Turton & Sons, Limited, and after 30 years with that company, he worked for a similar period with the Neepsend Steel & Tool Corporation. He was 84.

Sir EDMUND FRANK CRANE died in hospital at Cannes on September 18 at the age of 71. Sir Edmund and his brother, Mr. Harry Crane, founded the Hercules Cycle & Motor Company, Limited, which, in 1946, was sold to Tube Investments, Limited, for about £3,250,000. Sir Edmund then joined the board of Tube Investments and became joint managing director of the Hercules Cycle & Motor Company. In 1947, however, he gave up all executive responsibilities with the Hercules company and resigned from the board of Tube Investments.

Facts from the record
of Goodyear conveyor belting

STACKER

APPLICATIONS

A super quality belting for use where there is severe and frequent abrasion and flexing. It is ideal for conveying ores, stone, coke, glass cullet and other highly abrasive materials.

PHYSICAL PROPERTIES

Stacker exceeds British Standards Grade "A" in all requirements of fabric and rubber and may be used at temperatures up to 200 deg. F.
Made with the highest grade friction stock between plies for maximum flex-life.
Has the toughest cover obtainable, with the highest possible resistance to cutting, gouging and abrasion.
Completely inhibited against mildew damage.

AVAILABLE

Stacker is available in 28, 32, 36, 42 and 48 oz. duck weights, from 3 to 9 plies and in a full range of widths, lengths and cover gauges.

STYLE ORS

APPLICATIONS

For operations where extreme resistance to oil is necessary. Especially suitable for carrying oil-sprayed co
meat, fish or food where an

PHYSICAL PROPE

STYLE HRS

APPLICATIONS

Specially made for conveying hot, highly abrasive materials when the combination of resistance to high temperatures, extreme abrasion and severe flexing are essential.

PHYSICAL PROPERTIES

The carcass, cover and skim-coating between plies give all the heavy-duty characteristics of a Grade "A"

GOODYEAR
INDUSTRIAL RUBBER PRODUCTS

CONVEYOR BELTING · TRANSMISSION BELTING · V-BELTS · HOSE · FENDERING

Raw Material Markets

Iron and Steel

Demands for castings and raw materials follow closely on the lines of recent weeks and there is very little change in the pattern of business at the iron-foundries.

High-duty castings for many trades are in greatest request, with the motor vehicle trades requiring increased tonnages. Demands from machine-tool makers, general engineers, power and electrical plant manufacturers, collieries, steelworks, and others provide a good level of work and the foundries supplying to these trades are fairly busy. This results in appreciable tonnages of low-phosphorus pig-iron, hematite and, to a lesser extent, the refined grades, being taken up.

Of all grades the low-phosphorus and hematite irons are in heaviest demand.

Producing furnaces have so far been able to satisfy the needs of the foundries for these irons, and in the case of hematite, current outputs permit the furnaces to offer increased quantities when these are called for. Production of the low-phosphorus irons, however, is not much in excess of demands; in fact, some grades are fully covered by allocations.

The demand for high-phosphorus pig-iron continues slow and the foundries, including the light, jobbing, and textile foundries, are only moderately employed. In fact, some can only maintain a four-day working week.

Some of the engineering foundries using the high-phosphorus pig-iron are fairly busy and are able to take in a fair tonnage, but overall demands do not approach production and most makers are building up appreciable stocks.

When licences can be obtained, tonnages of all grades of pig-iron are available for export. Numerous inquiries are being received by export merchants, and although some consignments are being shipped abroad competition from overseas producers is keen. The steelworks are favourably placed in the supply of basic pig-iron and deliveries from home steelworks are satisfying both consumption and stock requirements. With the consignments which are being received from abroad, most of which are going into stock, good supplies are on hand to meet the forward ingot steel production programme.

The foundries have good supplies of scrap, but little difficulty is experienced by scrap merchants in disposing of heavy cast-iron and machinery scrap. The light and medium grades are fairly plentiful. Foundry coke is being delivered to meet production needs, and stocks at the foundries are satisfactory. Ganister, limestone, and firebricks are available according to requirements.

The re-rollers maintain fairly good outputs of their products, and although there is no heavy pressure for small bars and light sections, regular business is forthcoming from consumers and stockists. Reinforcing rods continue in heavy demand, and the improved call for strip and sheets is upheld. Most of the re-rollers have adequate quantities of steel semis, and home steelworks maintain a steady flow of supplies. Stocks on hand at the re-rolling mills are fairly good, but there are signs in some cases that these are diminishing as there has been a slight increase in demands.

These demands, however, have been lessened by the consignments which the re-rollers received from overseas, as stocks were increased appreciably by these deliveries.

Non-ferrous Metals

Copper consumers show singularly little interest in the market, seemingly taking the view that the metal is not cheap even below £200. Raising of the Bank rate to 7 per cent. would appear to militate against stockpiling of any commodity and consumers are not likely to foresake their policy of buying according to current needs unless they see the prospect of a substantial price rise in the near future. In none of the metals does a sharp rise in quotations seem likely.

Apart from making heavy holdings of the non-ferrous metals expensive, the Government's latest financial measures tend to have a bearish effect on the market. The result has been seen in quiet trading in all metals, and on balance prices are lower.

It will be some time before the effects of the Government measures on industry in general are seen. In the meantime, the non-ferrous metal markets may be expected to reflect the uncertainties of the situation.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

LEBANON, October 17—Malleable-iron fittings and ductile-cast-iron pipes and fittings, for International Co-operative Administration Procurement. (ESB/22611/57/ICA.)

PAKISTAN, October 7—Cast-iron pipes and fittings for the Department of Supply and Development, Government of Pakistan. (ESB/22620/57.)

SOUTH AFRICA, October 3—Electro magnet for extracting tramp-iron from conveyor-belt systems. Ingot iron core, well insulated owing to the salty and humid atmospheric conditions of operation. (ESB/22364/57.)

SOUTH AFRICA, October 11—Airless shot-blast cleaning plants for the Union of South Africa Railways, Stores Department, together with certain extras, to be detailed and quoted separately. (ESB/22599/57.)

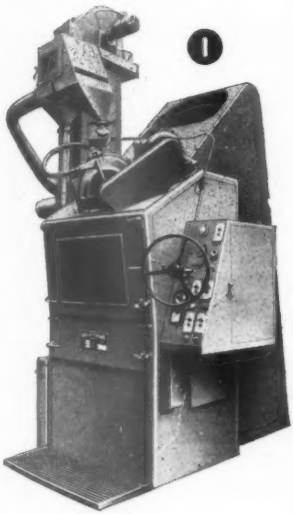
THAILAND, October 2—Foundry and smithy coke to specifications as follow: 300 tons foundry coke with 89 per cent. fixed carbon (min.) and maximum contents of 7.5 ash, 1.5 moisture, and 0.75 per cent. of sulphur, the size to be 3 in. It is to be noted that delivery is to be effected prior to December 1. (ESB/22398/57.)

TANGANYIKA, October 4—Gulley gratings, manhole covers, cast-iron step irons, for the Municipal Council of Dar Es Salaam. (ESB/22479/57.)

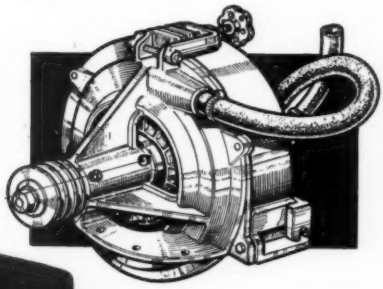
Hadfields' Staff Changes

Hadfields Limited, steelfounders etc., of Sheffield, announce the following appointments and staff changes: Mr. J. R. Rait, research controller leaves at the end of September to take up a new appointment as joint managing director of British Ferry Steel Company, a subsidiary of Duport Limited. Mr. T. H. Arnold has been appointed research controller and local director of Hadfields Limited. He has also been appointed to the board of directors of Hadfields Steels Limited, and Hadfields Forgings Limited. Mr. L. G. Finch has been appointed deputy research controller. Mr. D. R. Eastwood, deputy chief engineer, has been appointed a local director of Hadfields Limited, and a director of Hadfields Foundry and Engineering Company, a subsidiary of Duport Limited. Mr. T. H. joined the company in 1946 as steelfoundry controller, retires at the end of the month.

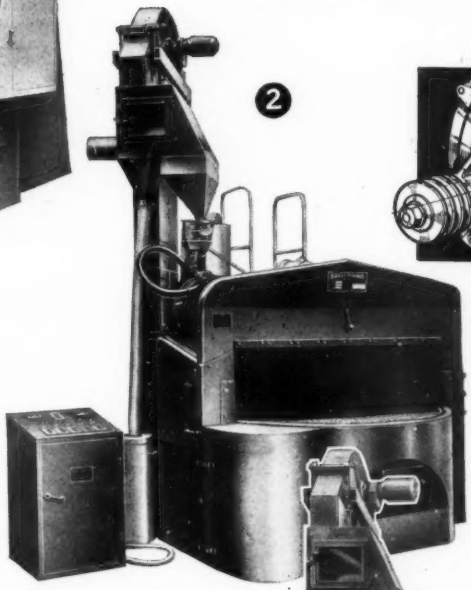
Shot Blast Equipment



This A-S-L Turbine is the most modern Shot Blasting Unit available. The bi-phase air injection system enables shot to be projected at greater speeds using lower power with fewer replacements. The economies effected in spare parts alone are very substantial.



Baker Perkins High Speed Bi-Phase A-S-L Turbine, British Patent, No. 510681.

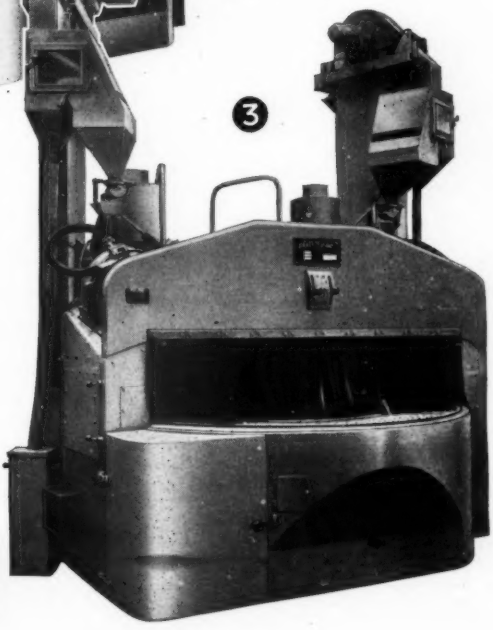


1 ROTARY BARREL

2 CADET

3 MEDIUM

These machines do not require pits or special foundations.



Our standard range of Rotating Barrel and Table Shot Blast Machines is capable of handling a wide range of Foundry products. Both types are semi-automatic, the rotating barrels being equipped with skip hoist loading gear and frontal discharge mechanism. These modern highly efficient machines are in use in Foundries all over the world, and are built to the high standards of design, materials and workmanship characteristic of all Baker Perkins' machines.

BAKER PERKINS LIMITED
ENGINEERS
WESTWOOD WORKS · PETERBOROUGH

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

September 25, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S. 1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £52 15s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 7d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £96 0s. 0d. to £99 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. per unit; over 6 per cent. C, £94 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 33s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr.; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3d. to 2s. 3½d. per lb. Cr; 0.10 per cent. C,* 2s. 3½d. to 2s. 3¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3¾d. to 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent., Nb + Ta, 22s. 0d. to 23s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £87 19s. 3d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £33 1s. 6d.; tested, 0.08 to 0.33 per cent. C, £34 1s. 6d.; hard (0.41 to 0.60 per cent. C), £35 3s. 0d.; silico-manganese, £44 2s. 6d.; free-cutting, £37 5s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 7s. 0d.; silico-manganese, £44 10s. 0d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 18s. 6d.; acid, up to 0.25 per cent. C, £43 10s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 12s. 0d.; boiler plates (N.-E. Coast), £45 2s. 0d.; floor plates (N.-E. Coast), £44 1s. 0d.; angles, N.-E. Coast, £40 6s. 6d.; joists, N.-E. Coast, £40 2s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over, £40 8s. 0d. (under 10 tons to 4 tons, £41 5s. 6d.; under 4 tons to 2 tons, £41 10s. 6d.); hoop and strip, coils, £40 10s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £45 16s. 0d.; black sheets (hand mill), 24 g., £59 4s. 6d.; galvanized corrugated sheets, 24 g., £68 17s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £69 9s. 6d.; nickel-chrome, £100 12s. 6d.; nickel-chrome-molybdenum, £112 16s. 6d.

NON-FERROUS METALS

Copper.—Cash, £191 0s. 0d. to £191 10s. 0d.; three months, £194 0s. 0d. to £195 0s. 0d.; settlement, £191 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 11½d. per lb.; rods, 226s. 3d. per cwt. basis; 20 s.w.g., 259s. 6d. per cwt.

Tin.—Cash, £739 10s. 0d. to £740 0s. 0d.; three months, £739 10s. 0d. to £740 0s. 0d.; settlement, £740 0s. 0d.

Lead (Refined Pig).—Second half September, £88 15s. 0d. to £89 5s. 0d.; second half December, £89 15s. 0d. to £90 0s. 0d.

Zinc.—Second half September, £71 10s. 0d. to £71 15s. 0d.; second half December, £72 5s. 0d. to £72 10s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £106 5s. 0d.; rolled zinc (boiler plates), all English destinations, £104 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £85.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 7½d. per lb.; sheets to 10 w.g., 171s. 3d. per cwt.; wire, 2s. 4½d.; rolled metal, 168s. 9d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £140; B6 (85/15), — ; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £187; HTB2 (38 tons), — ; HTB3 (48 tons), — .

Gunmetal.—BS1400, LG2 (85/5/5/5), £175; LG3 (86/7/5/2), £186; G1 (88/10/2/½), £247; (88/10/2/1), £235.

Phosphor Bronze.—BS1400, PB1 (AID released), £255 per ton.

Phosphor Bronze Strip, etc.—Strip, 249s. 6d. per cwt.; sheets to 10 w.g., — per cwt.; wire, 3s. 7¾d. per lb.; rods, 3s. 0d.; tubes, 3s. 0d.; chill cast bars: solids 2s. 11½d., cored 3s. 0½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 6½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 11d.; special quality turning rod, 10 per cent., ½ in. dia., 3s. 10½d., in straight lengths, 3s. 10d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £85 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, £225; AB2, — .

* Average 68-70 per cent.